

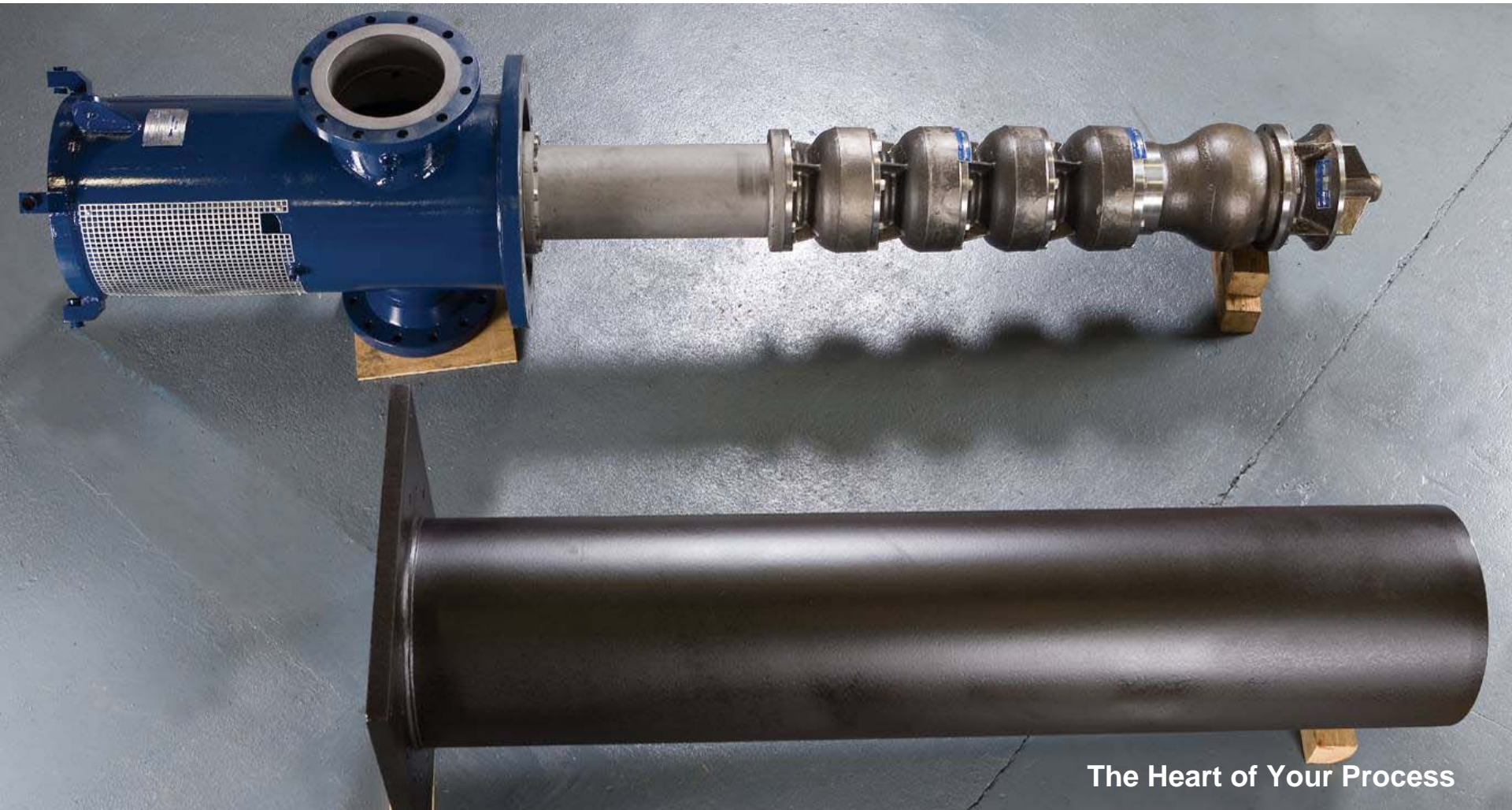
**Product Line Module**

**SULZER**

# **SJD (CEP) Vertical Condensate Extraction Pumps**

Sulzer Pumps

Version 1 | July 2011



**The Heart of Your Process**

## Presentation Content Overview

- Introduction (Applications)
- Available designs: Single Suction & Double Suction First Stage
- Pump designation and sizes
- Operating data
- Performance range 50 Hz 1500 rpm Metric units
- Performance range 60 Hz 1200 & 1800 rpm US units
- Materials of construction
- Design features and benefits
- Thrust bearing location
- Detail of thrust bearing in pump
- Shaft sealing
- Available options

# SJD (CEP) Vertical Condensate Extraction Pumps

## Introduction

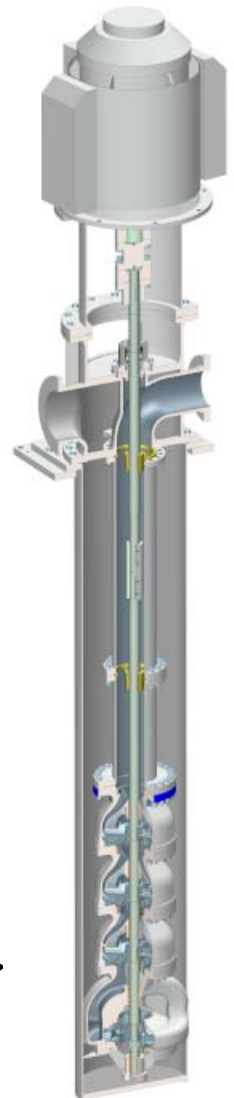


- The SJD (CEP) pumps are vertically suspended, double casing (canned), bowl diffuser pumps.
- These pumps are specially designed for Condensate Extraction service in power plants to meet the low NPSHa criteria (API requirements are not applicable).
- There are two distinct designs for the CEP pumps.

← Single Suction

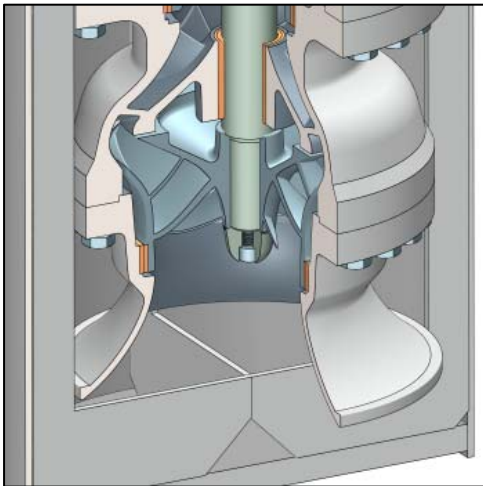
and

Double Suction →



## Available Designs:

### Single Suction & Double Suction First Stage



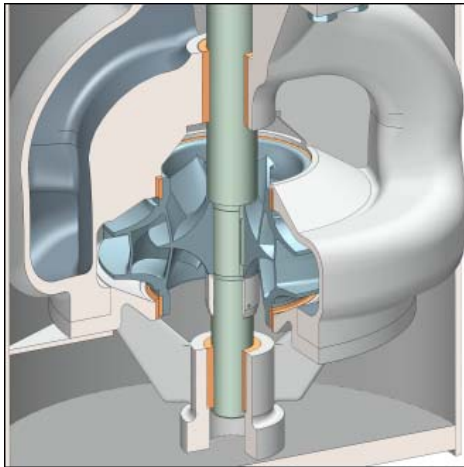
#### Single Suction First Stage Design

These CEP pumps are intended for application in Concentrating Solar, Biomass, Combined Cycle and small size Coal Fired Power Plants.

The pump is designed with a single suction, high NSS, first stage impeller. Thus resulting in a flat NPSHr characteristic curve which helps to minimize the barrel and pump length.

## Available Designs:

### Single Suction & Double Suction First Stage



### Double Suction First Stage Design

These CEP pumps are intended for application in medium and large size Coal Fired and Nuclear Power Plants.

Designed with a double suction, Low NSS, first stage impeller. Thus resulting in a steeper NPSHr characteristic curve to comply with NSS limitation (< 11,000). This requirement is normally present in NAM specifications. This results in "still acceptable" overall barrel and pump length.

### OLD Pump designation: BDC 300-400 d+3s

<b>BDC</b>	SPU Vertical Condensate pump - B-Range
<b>300</b>	Discharge diameter [mm]
<b>400</b>	approximate nominal full diameter of suction impeller [mm]
<b>d+3s</b>	One double entry suction impeller + 3 single entry series impellers

## Pump Designation & Sizes

### NEW SJD + Series Stage + Suction Stage + Total Number of stages

#### SJD BC545-BD400 2s (EXAMPLE)

<b>SJD</b>	Sulzer Johnston Dynaline
<b>BC</b>	SPU vertical condensate pump – single entry series impeller
<b>545</b>	Corresponding nominal outer mean diameter of series impeller [mm]
<b>BD</b>	SPU vertical condensate pump – double entry suction impeller
<b>400</b>	approximate nominal full diameter of suction impeller [mm]
<b>2s</b>	number of total stages

#### SJD 20DHC-BKC350 5s (EXAMPLE)

<b>SJD</b>	Sulzer Johnston Dynaline
<b>20</b>	approximate outer bowl diameter of series stages
<b>DHC</b>	Johnston vertical turbine pump
<b>BKC</b>	SPU vertical condensate pump – single entry suction impeller
<b>350</b>	approximate nominal full diameter of suction impeller [mm]
<b>5s</b>	number of total stages

# SJD (CEP) Vertical Condensate Extraction Pumps

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## Pump Sizes

SJD CEP 16DLC-BKC 240

SJD CEP 16DHC-BKC 240

SJD CEP 18DHC-BKC 290

SJD CEP 18DHC-BKC 320

SJD CEP 20DLC-BKC 320

SJD CEP 20DHC-22AVCRDA

SJD CEP 20DHC-22AVCRDB

SJD CEP 20DHC-BKC 350

SJD CEP 24DLC-22AAVCRD

SJD CEP 24DHC-22AAVCRD

SJD CEP 24DHC-24AVCRD

SJD CEP BC 545-BD 400

SJD CEP BC 580-BD 425

SJD CEP VC27A-BDa 490

SJD CEP BC 690-BD 550

SJD CEP BC 750-BD 600

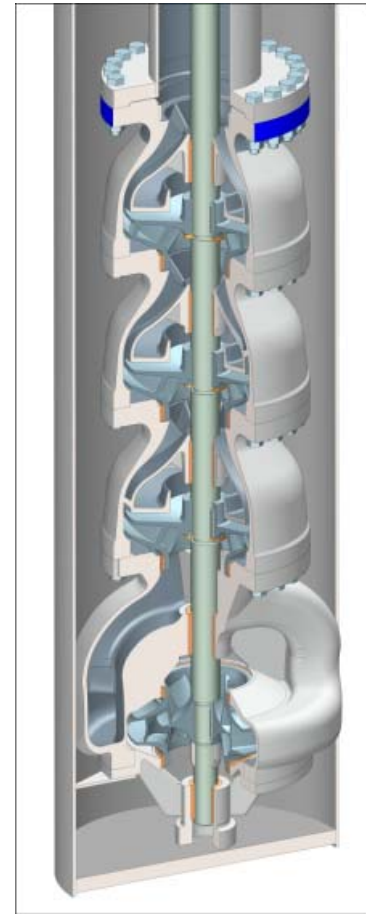
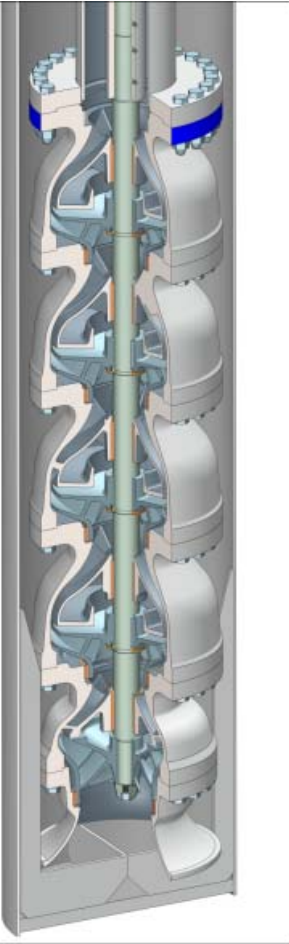
SJD CEP VC29A-32AVCD

SJD CEP BC 820-BD 650

SJD CEP BC 880-BD 700

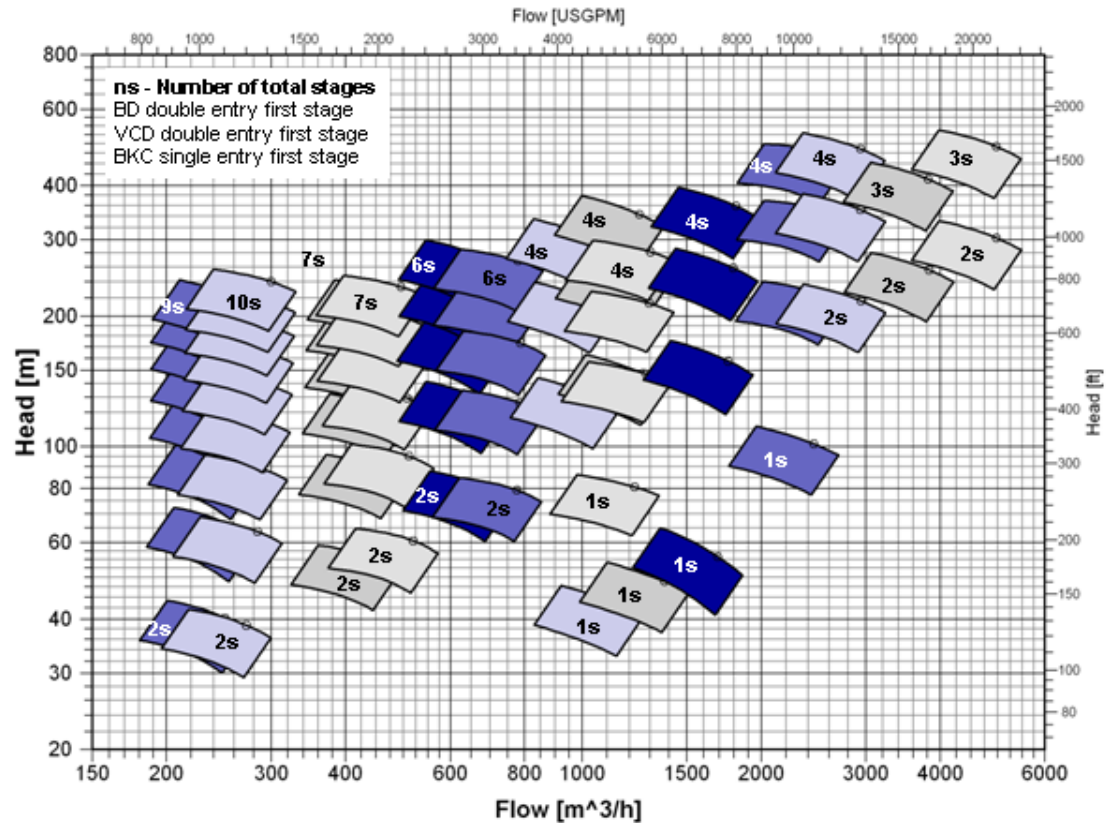
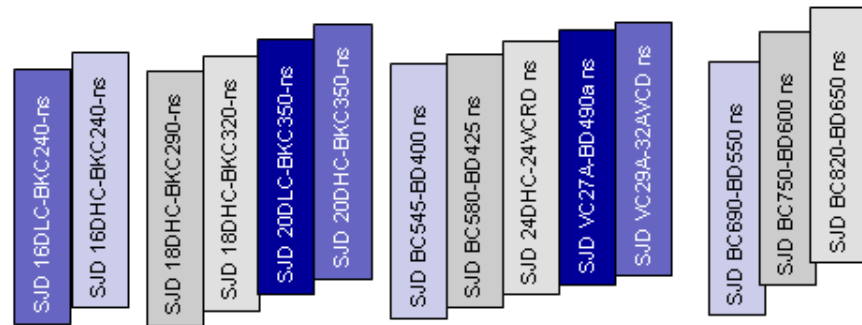
### Operating Data - 50 Hz Pumps

Capacity .....	Q = 210 - 4900 m <sup>3</sup> /hr
Head .....	up to H = 400m
Suction Pressure.....	≤ 4 bar (58 psi)
Max Operating Pressure .....	up to 93.8 bar (1360 psi)
Temperature .....	0°C to 100°C (32°F to 212°F)
Speed .....	1480 RPM
Direction of Rotation .....	Counterclockwise as seen from drive end



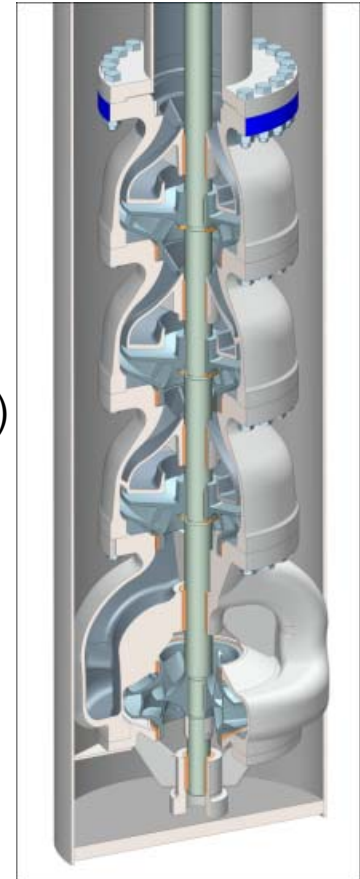
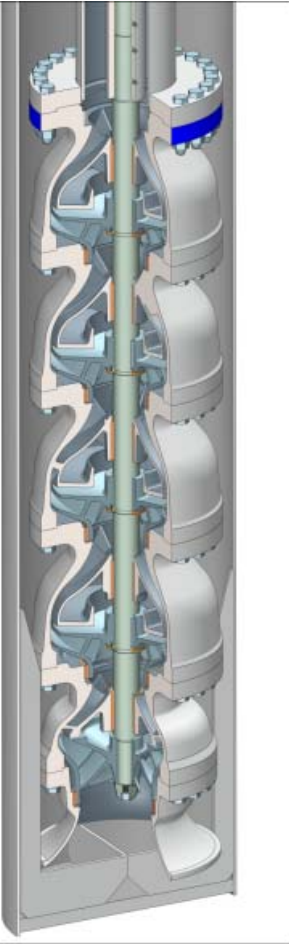
# SJD (CEP) Vertical Condensate Extraction Pumps

## Performance Range – 50 Hz, 1480 rpm



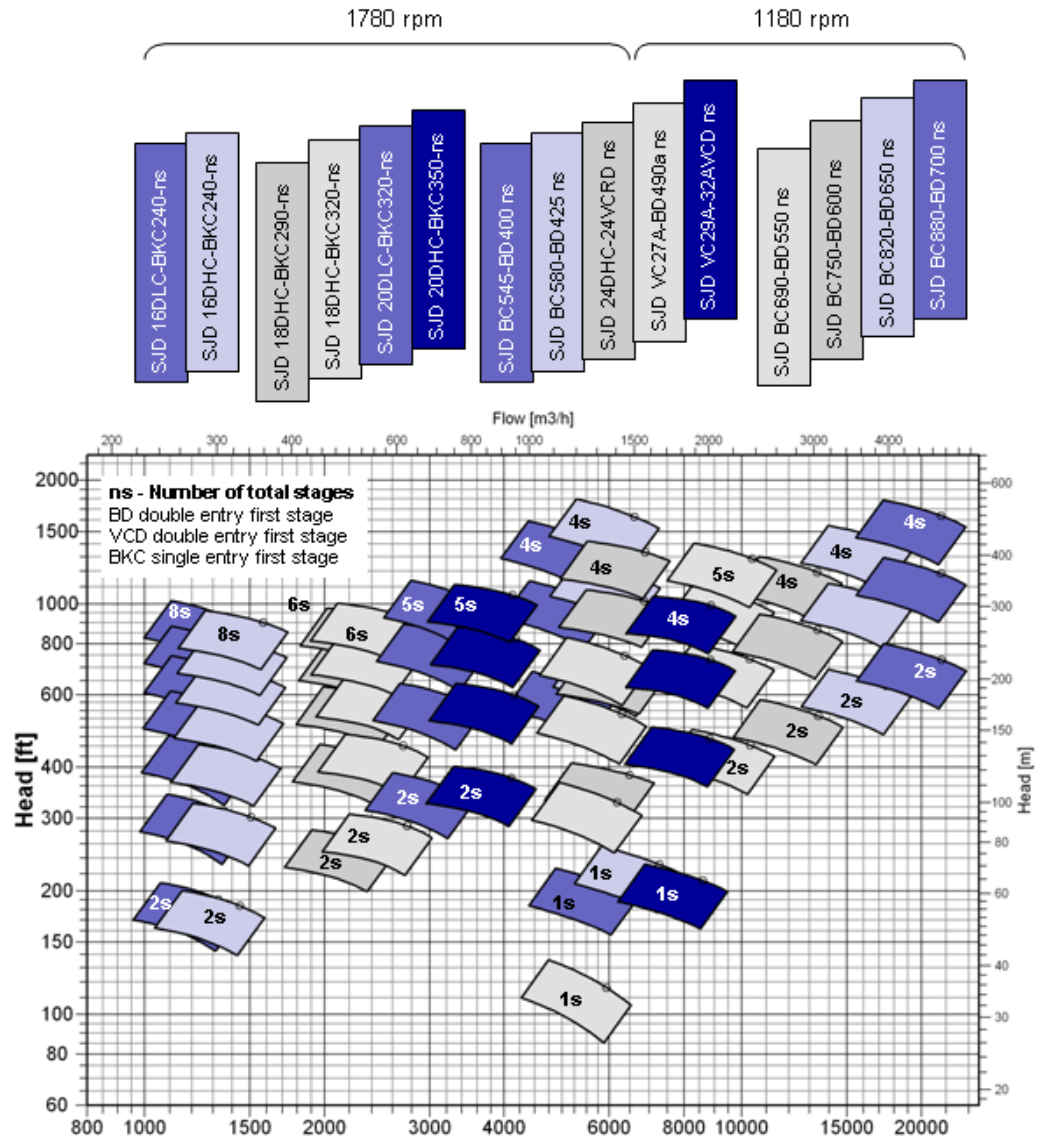
### Operating Data - 60 Hz

Capacity .....	Q = 920 to 21,560 GPM
Head .....	up to H = 1300 ft
Suction Pressure .....	≤ 58 psi (4 bar)
Max Operating Pressure .....	up to 1360 psi (93.8) bar
Temperature .....	32°F to 212°F (0°C to 100°C)
Speed .....	1180, 1780 RPM
Direction of Rotation .....	Counterclockwise as seen from drive end



# SJD (CEP) Vertical Condensate Extraction Pumps

## Performance Range – 60 Hz, 1180 & 1780 rpm



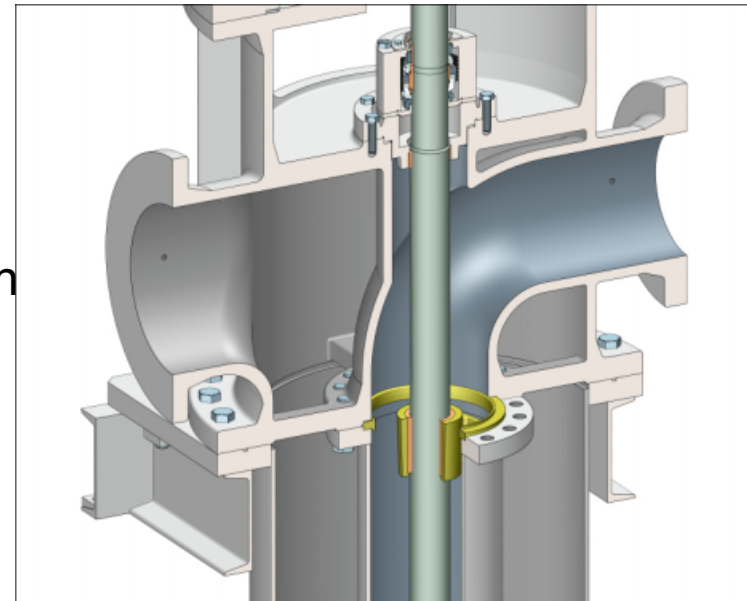
# SJD (CEP) Vertical Condensate Extraction Pumps

## Materials of Construction

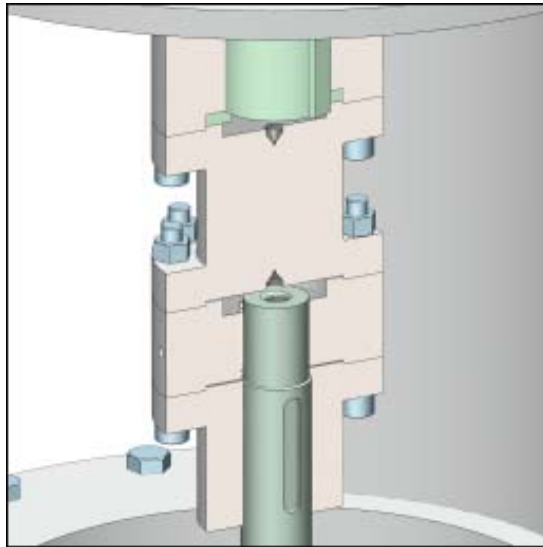
Component	S-1 Mod (Opt 1 & 2)	S-5 Mod	S-6 Mod
<b>Bowls</b>	Cast Iron, Ductile Iron	Carbon Steel	12% Chrome
<b>Stationary Ring</b>	Cast Iron, 12% Chrome	Cast Iron, 12% Chrome	12% Chrome
<b>Suction Impeller</b>	12% Chrome	12% Chrome	12% Chrome
<b>Impeller Ring (Suction Impeller)</b>	12% Chrome	12% Chrome	12% Chrome
<b>Series Impellers</b>	Cast Iron, 12% Chrome	Cast Iron, 12% Chrome	12% Chrome
<b>Impeller Ring (Series Impeller)</b>	Cast Iron, 12% Chrome	Cast Iron, 12% Chrome	12% Chrome
<b>Shafts</b>	416 or 420 St. St.	416 or 420 St. St.	416 or 420 St. St.
<b>Suction Barrel</b>	Carbon Steel	Carbon Steel	Carbon Steel

### Design Features & Benefits – Suction and Discharge Head

- Cast and Fabricated suction and discharge head available with 150# suction and 300# discharge flange as std. execution except in the largest sizes
- Separate fabricated driver stand. Allows servicing the thrust bearing, mechanical seal and throttle bushing without removing the motor.
- Removable seal housing. Allows servicing the throttle bush without removing the head.
- Optional Double O-ring seal with water injection at the flange joint between the head and barrel

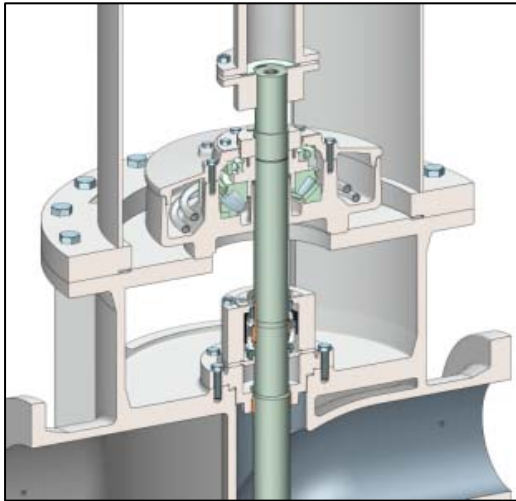


### Design Features & Benefits – Thrust Bearing in Motor



- Rigid (flanged adjustable) coupling with spacer between driver and pump shaft. Allows servicing mechanical seals as needed.

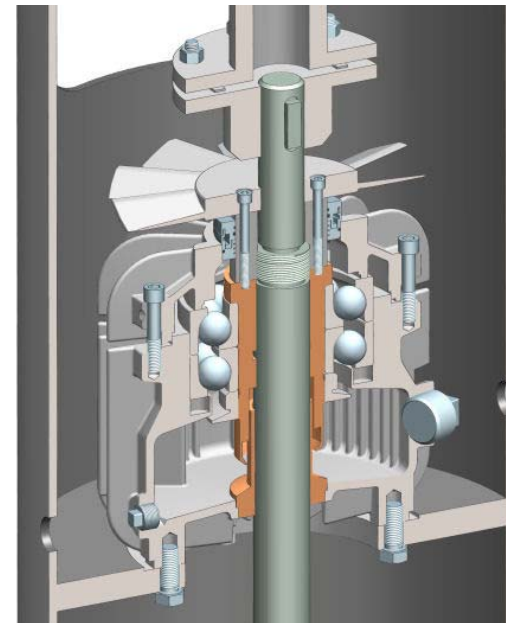
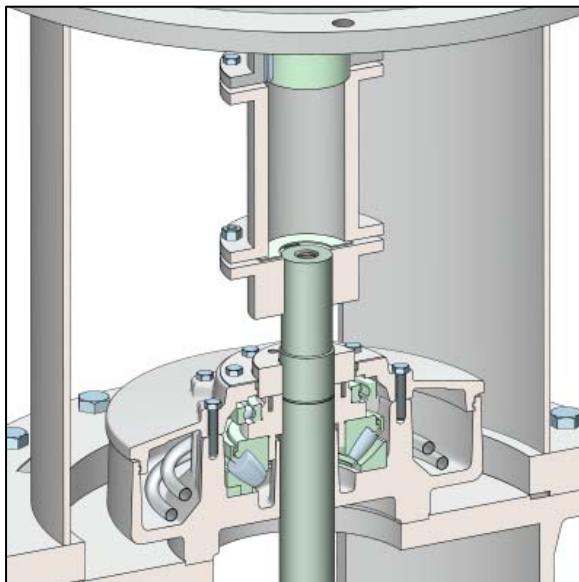
### Design Features & Benefits – Thrust bearing in Pump



- Sized to take the axial thrust produced by the pump during normal operation and start-up.
- Flexible coupling with spacer between driver and pump shaft. Allows servicing thrust bearing and mechanical seals as needed.

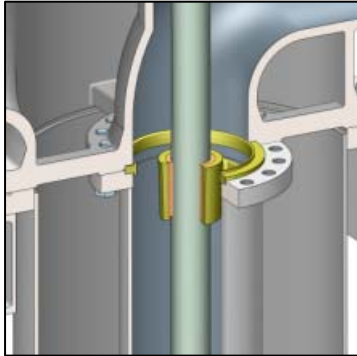
### Thrust Bearing Details (if Supplied in Pump)

- **VTB/VALR** – oil lubricated, angular contact and spherical roller bearing
- To be Selected for L10 bearing life of:
  - 25,000 hrs at BEP and
  - 16,000 hrs at Min Flow
- VTB are air cooled. A cooling coil is available as needed.
- VALR are supplied with a cooling coil. (fan cooled design available upon request)



If the thrust load capacity of the antifriction bearings is exceeded, Michell bearings can be supplied as an option

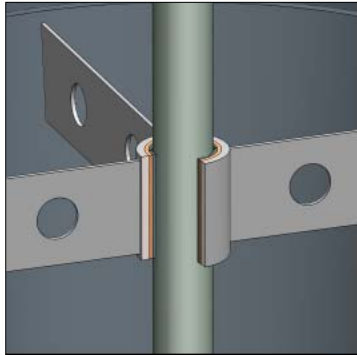
### Design Features & Benefits – Column Assembly



- Flanged fabricated column pipes. Bolted joint flange O-ring sealed. Provides adequate sealing without over stressing bolts.

- Each column joint has a bearing spider which houses the replaceable bearing bushing:

- drop-in bearing spider –  $\leq 14"$  (DN 350)
- integral spider - 16"+ (DN 400+)

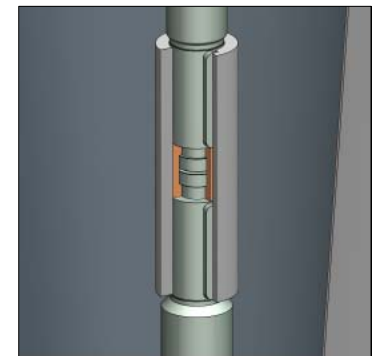
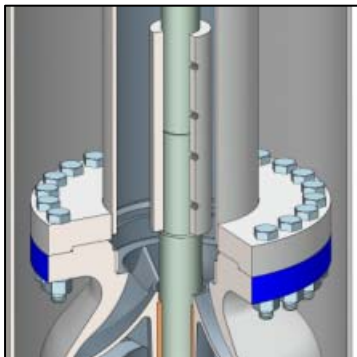


- Drop-in bearing spider designed with an offset to allow re-use the same shaft by flipping the bearing spider.

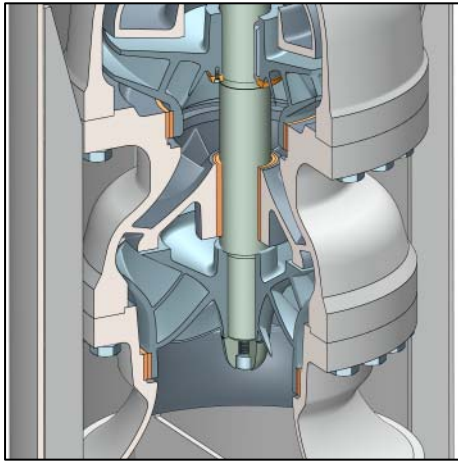
- Product lubricated Carbon Graphite bearing bushings. Provides longer maintenance free periods.

- Threaded intermediate coupling for the smaller pump sizes with shaft diameter up 68 mm.

- Sleeve or thrust stud intermediate coupling for larger shaft diameters.

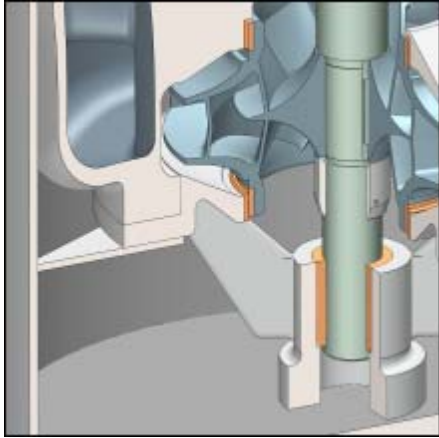


### Design Features & Benefits – Single Suction First Stage



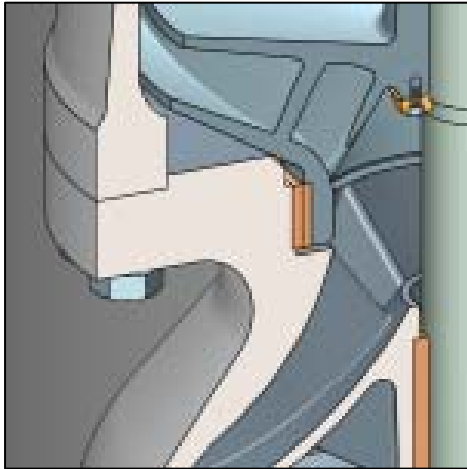
- First stage single suction impeller with split vanes. The high suction specific speed impeller provides low and flat NPSHr curve and high first stage head.
- Overhung impeller on first stage. Suction bell with no ribs or tail bearing.
- Fabricated barrel with bottom and lateral anti-rotation ribs. Provides uniform and adequate velocity approach downstream along the barrel length.

### Design Features & Benefits – Double Suction First Stage



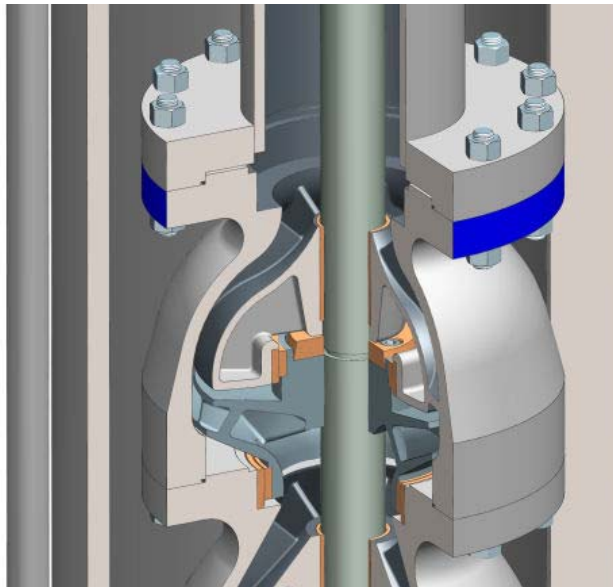
- First stage double suction impeller provides low suction specific speed ( $< 11.000$ ) with adequate NPSHr curve.
- Between bearings double suction impeller on first stage provides high head for first stage.
- Dual wear ring surfaces. Provides replaceable wear rings for all impellers, bowls and volute case.

### Design Features & Benefits – Bowl Assembly



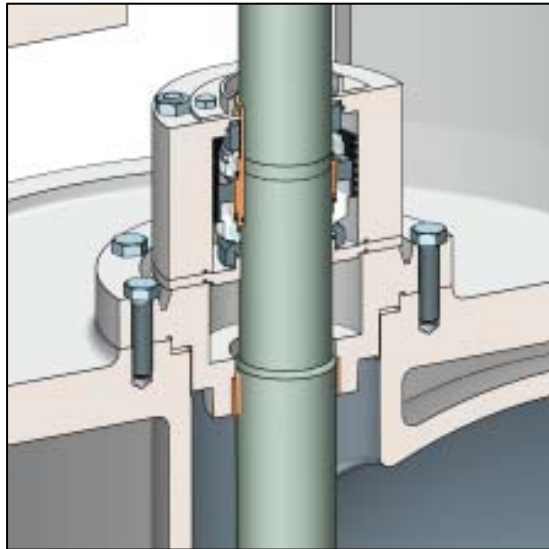
- Dual wear ring surfaces. Provides replaceable wear rings for impeller and bowl.

- Product lubricated Carbon Graphite bearing bushes on all bowls. Provides longer maintenance free periods.



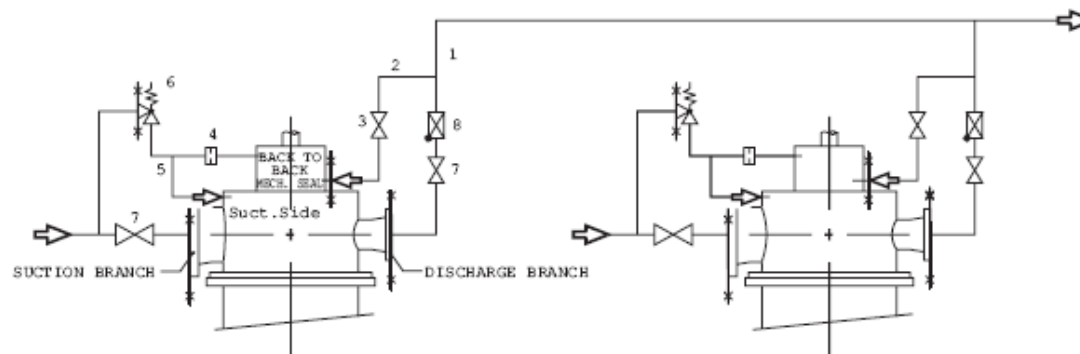
- Bolted joint flange and O-ring sealed pump bowls.

- Optional Thrust Balanced Series Stage Impellers

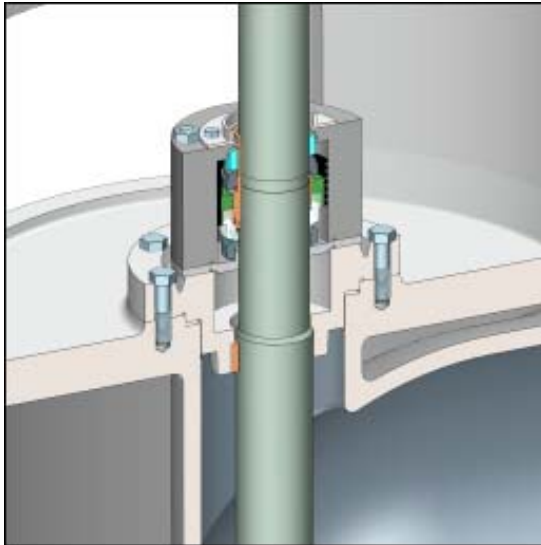


### Shaft Sealing – 50Hz Pumps

- Shaft sealing by Dual Mechanical Seal in Back-to-Back Configuration.
- Dual Seals are used to avoid air inlet through the seal due to low suction pressure.
- Burgmann or John Crane Cartridge Seals are available (seal housing compliant with API 682).
- See below for piping diagram.

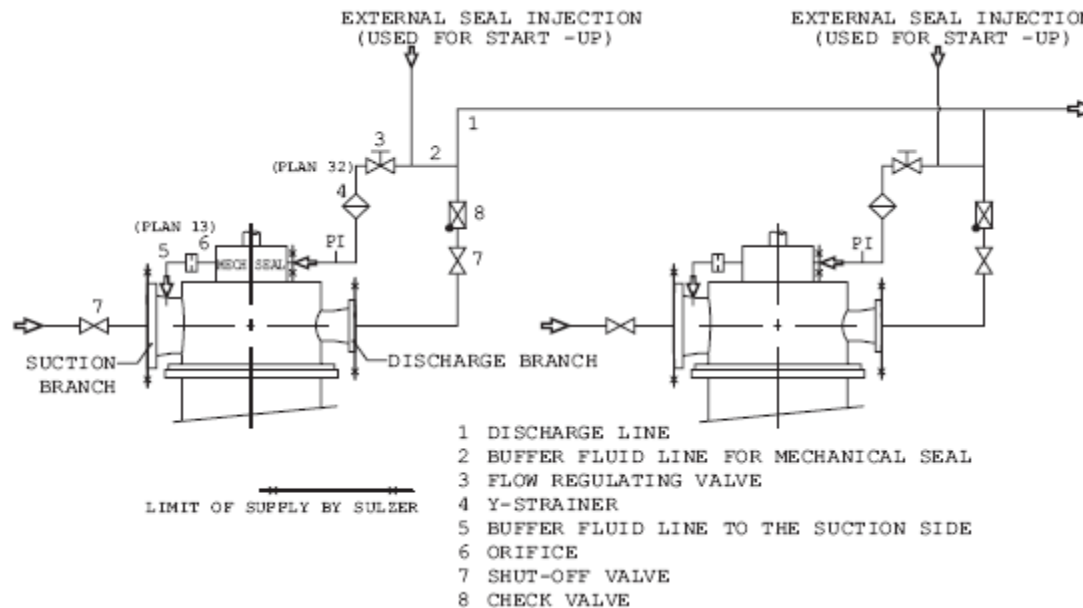


- 1 DISCHARGE LINE
- 2 BUFFER FLUID LINE FOR MECHANICAL SEAL
- 3 SHUT-OFF VALVE
- 4 ORIFICE
- 5 BUFFER FLUID LINE TO THE SUCTION SIDE
- 6 SAFETY VALVE
- 7 SHUT-OFF VALVE
- 8 CHECK VALVE



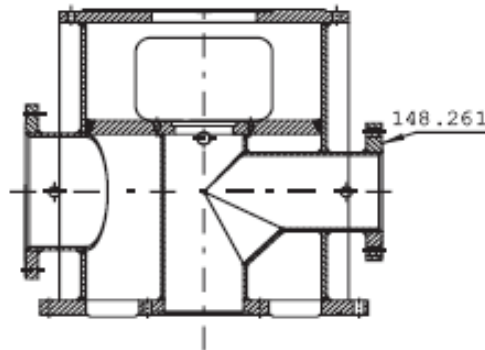
### Shaft Sealing – 60Hz Pumps

- Shaft sealing by Single Mechanical Seal.
- Burgmann or John Crane Cartridge Seals are available (seal housing compliant with API 682).
- Seal piping according to API plan 13 and Plan 32. See below for piping diagram.



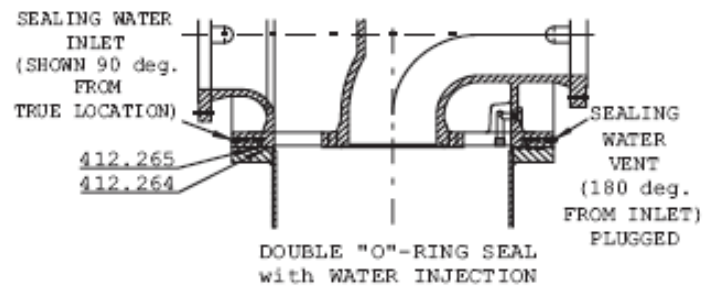
# SJD (CEP) Vertical Condensate Extraction Pumps

## Available Options



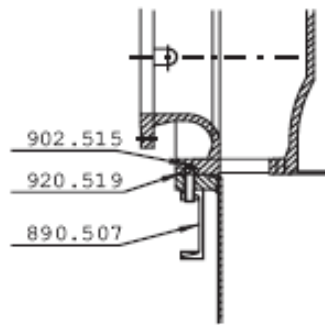
FABRICATED SUCTION and DISCHARGE HEAD

Option No. 1



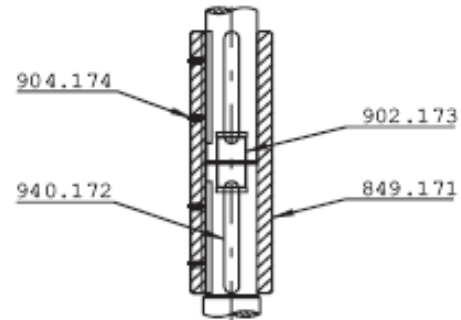
DOUBLE "O"-RING SEAL with WATER INJECTION

Option No. 2



BASEPLATE

Option No. 3

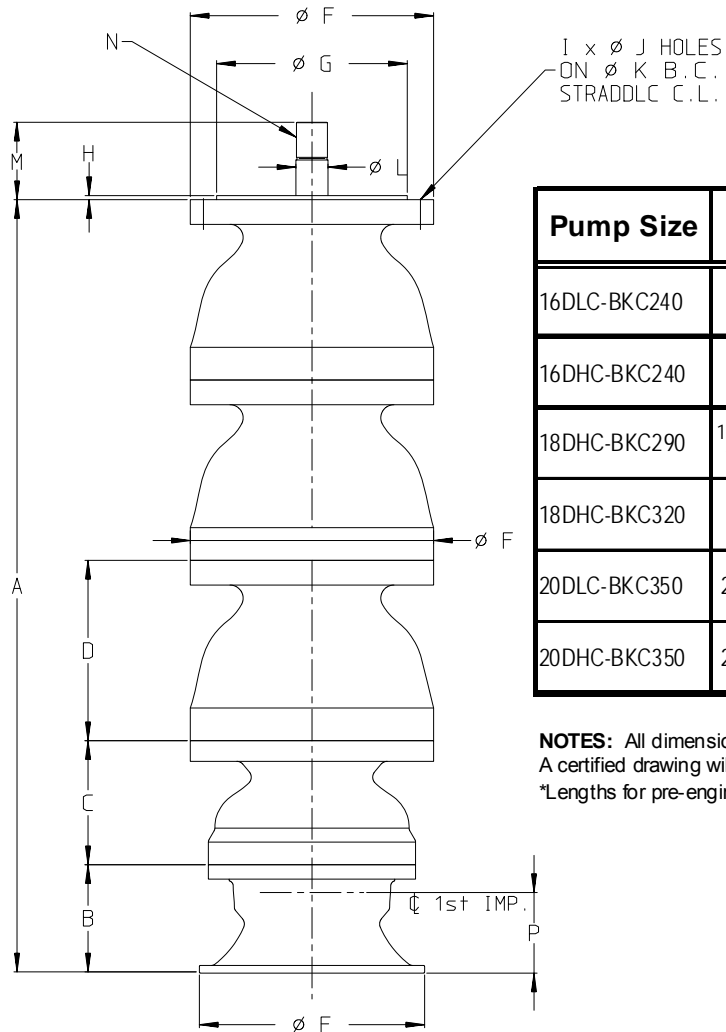


POSITIVE DRIVE LINESHAFT COUPLING  
Shaft Dia.  $\leq$  68 mm

Option No. 4

# SJD (CEP) Vertical Condensate Extraction Pumps

## Complete Bowl Assembly Dimensions

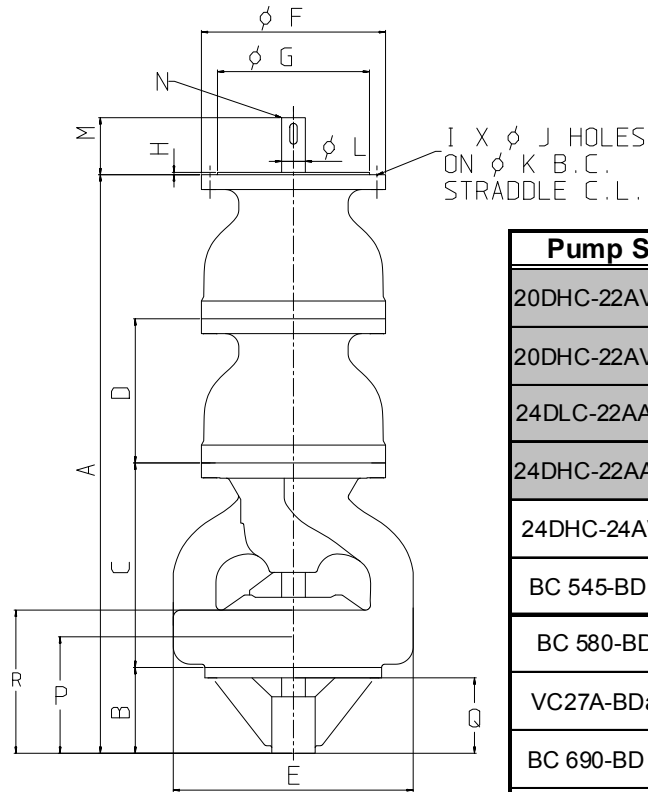


Pump Size	A*	B	C	D	E	F	G	H	I	J	K	L	M	N	P
16DLC-BKC240	N/A	204	208	298	315	391	12	14	12	24 mm	352.55	49.20	254	Threaded Coupling	134.3
16DHC-BKC240	N/A	204	208	298	315	391	12	14	12	24 mm	352.55	49.20	254	Threaded Coupling	134.3
18DHC-BKC290	1497 & 1846	210	240	349	435	452	368	8	16	24	412	61.90	150	Threaded Coupling	132.1
18DHC-BKC320	N/A	280	305	356	457	457	356	0	16	24 mm	432	61.90	10	Threaded Coupling	181.4
20DLC-BKC350	2612	265	307	408	515	514	430	8	20	24 mm	472	74.68	263	Keyed Coupling	156.0
20DHC-BKC350	2204	265	307	408	515	514	430	8	24	26 mm	472	74.68	200	Keyed Coupling	156.0

**NOTES:** All dimensions are in inches unless otherwise noted and are for guidance only.  
 A certified drawing will be provided in all cases of actual construction. [See weight for Complete Bowl Assembly, B03.](#)  
 \*Lengths for pre-engineered bowl assemblies

# SJD (CEP) Vertical Condensate Extraction Pumps

## Complete Bowl Assembly Dimensions



Pump Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R
20DHC-22AVCRDA	N/A	240	568	408	705	514	430	8	20	24 mm	472	68	254	Keyed Coupling	335	215	425
20DHC-22AVCRDB	N/A	240	568	408	705	514	430	8	20	24 mm	472	68	254	Keyed Coupling	335	215	419
24DLC-22AAVCRD	N/A	289	690	486	810	610	512	8	24	28 mm	562	87	254	Keyed Coupling	401	254	505
24DHC-22AAVCRD	N/A	289	690	486	810	610	512	8	24	28 mm	562	87	254	Keyed Coupling	401	254	505
24DHC-24AVCRD	N/A	899	830	486	900	610	512	8	24	28 mm	562	87	254	Keyed Coupling	401	183	566
BC 545-BD 400	N/A	244	876	305	920	750	635	15	24	27 mm	695	92	254	Keyed Coupling	365	183	460
BC 580-BD 425	N/A	254	931	325	980	805	675	15	24	30 mm	745	92	254	Keyed Coupling	375	210	489
VC27A-BDa 490	N/A	285	1130	485	1125	755	615	15	24	34 mm	686	112	254	Keyed Coupling	450	243	592
BC 690-BD 550**	N/A	155	1453	405	1260	957	800	18	24	N/A	N/A	114	254	Keyed Coupling	482	59	430
BC 750-BD 600	N/A	169	1585	440	1374	1040	870	20	24	36 mm	950	114	254	Keyed Coupling	344	64	469
VC29A-32AVCD	N/A	390	952	552	1160	787	630	22	24	40 mm	700	152	254	Keyed Coupling	542	189	532
BC 820-BD 650**	N/A	183	75	481	1488	1422	1189	22	N/A	N/A	N/A	152	254	Keyed Coupling	568	69	508

**NOTES:** All dimensions are in inches unless otherwise noted and are for guidance only.

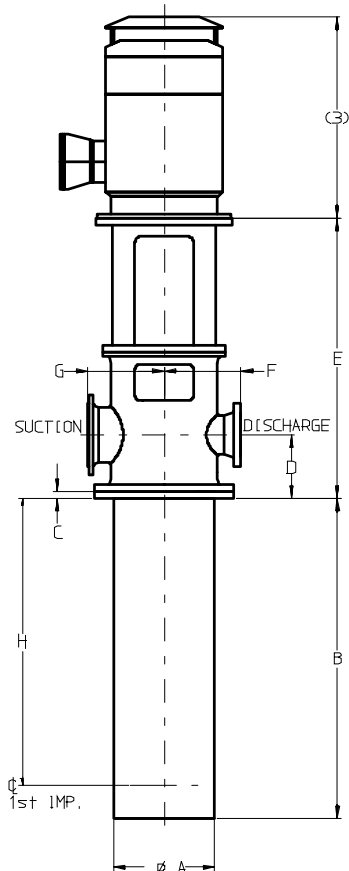
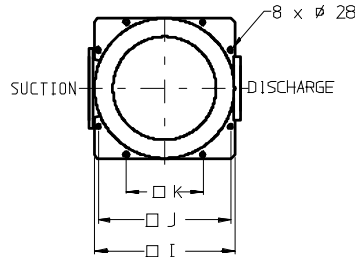
A certified drawing will be provided in all cases of actual construction. [See weight for Complete Bowl Assembly, B03.](#)

\*\*Lengths are estimates

Highlighted Bowl assembly exist and are available in the BOM system

# SJD (CEP) Vertical Condensate Extraction Pumps

## Standardized Pump Lengths



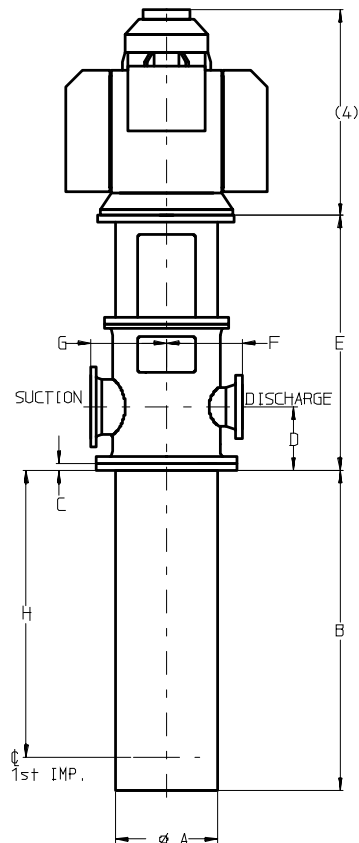
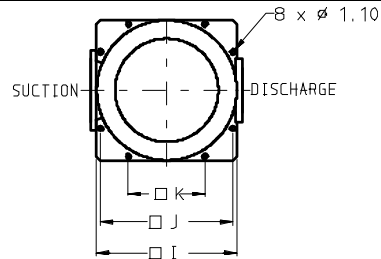
Pump Size	Flange Size		A	B	C	D	E	F	G	H	I	J	K
	Discharge (1)	Suction (2)		(5)		(4)		(4)	(4)				
18DHC-BKC290-4s	8"	12"	609.6	1920	40	381	1680	457	457	1626	840	795	460
18DHC-BKC290-5s	8"	12"	609.6	3060	40	381	1680	457	457	2765	840	795	460
20DHC-BKC350-5s (a) (7)	10"	14"	680	3655	45	390	1768	550	550	3303	910	834	580
20DHC-BKC350-5s (b) (7)	10"	14"	680	4255	45	390	1768	550	550	3903	910	834	580
20DLC-BKC350-6s	10"	14"	680	3255	45	390	1768	550	550	2911	910	834	580

**NOTES:**

- (1) Discharge flange ratings are ANSI B16.5 Class 300 R.F.
- (2) Suction flange ratings are ANSI B16.5 Class 150 R.F.
- (3) For driver dimensions contact your local representative.
- (4) Nozzle location tolerance  $\pm 3$  mm.
- (5) Suction can tolerance  $\pm 6$  mm.
- (6) All dimensions are in mm unless otherwise noted and are for guidance only. A certified drawing will be provided in all cases of actual construction.
- (7) (a) and (b) correspond to different standardized Pump lengths.

# SJD (CEP) Vertical Condensate Extraction Pumps

## Standardized Pump Lengths



Pump Size	Flange Size		A	B	C	D	E	F	G	H	I	J	K
	Discharge	Suction (3)		(6)		(5)		(5)	(5)				
20DHC-22AVCRDA-4s	12 <sup>(1)</sup>	18	30	346.7	1.77	17.32	67.76	21.65	21.65	329.8	38.74	35.98	26.77
20DHC-22AVCRDB-4s	12 <sup>(1)</sup>	18	30	246.3	1.77	17.32	67.76	21.65	21.65	229.4	38.74	35.98	26.77
24DHC-22AAVCRD-3s	12 <sup>(2)</sup>	20	34	309.1	1.97	18.50	71.46	23.62	23.62	287.3	42.52	40.16	28.35
24DLC-22AAVCRD-3s	12 <sup>(2)</sup>	20	34	350.4	1.97	18.50	71.46	23.62	23.62	328.7	42.52	40.16	28.35
24DLC-22AAVCRD-4s	12 <sup>(2)</sup>	20	34	297.2	1.97	18.50	71.46	23.62	23.62	275.7	42.52	40.16	28.35

**NOTES:**

- (1) Discharge flange ratings are ANSI B16.5 Class 300# R.F.
- (2) Discharge flange ratings are ANSI B16.5 Class 400# R.F.
- (3) Suction flange ratings are ANSI B16.5 Class 150# R.F.
- (4) For driver dimensions contact your local representative.
- (5) Nozzle location tolerance ± 0.125".
- (6) Suction can tolerance ± 0.250".
- (7) All dimensions are in inches and are for guidance only. A certified drawing will be provided in all cases of actual construction.

# SJD (CEP) Vertical Condensate Extraction Pumps

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**SULZER**

Sulzer Pumps

**Thank you!!!**