



HEAVY DUTY PUMPS AND WATER TURBINE MFG.CO.



API PUMPS



SALES OFFICE:

No.2 , Kazemi moghadam St. , Farokhi yazdi St.

8th. Negarestan St. Pasdaran , Tehran , Iran

Tel:(+9821) 26 70 14 38 / 26 70 15 48 / 26 70 15 78
26 70 15 82 / 26 70 15 98 / 22 84 11 52

Fax:(+9821) 22 84 06 81 / 22 86 02 35

E-mail: info@pumpturbine.ir , sale@pumpturbine.ir

FACTORY:

Sento Road,Gharamalak Industrial Zone,Tabriz,Iran

P.O.Box: 518-341

Tel:(+9841) 32 89 93 04 - 6 / 32 89 95 50 - 3

Fax:(+9841) 32 89 01 44

www.pumpturbine.ir

ABOUT PETCO

PETCO has been established in 1991 For design and manufacturing of various Types of pumps in refineries, power plants, Chemical and petrochemical plants, pump Stations, water and waste water treatment Plants and etc.

The factory is located in TABRIZ city in an Area of 80000 m² and, total covered area is 20000 m² with largest hydraulic test Facility in middle east .

HEAVY DUTY PUMPS & WATER TURBINE MFG. CO.



CP PUMPS



PETCO CP PUMPS (acc. to latest ed. of API 610 Standard):

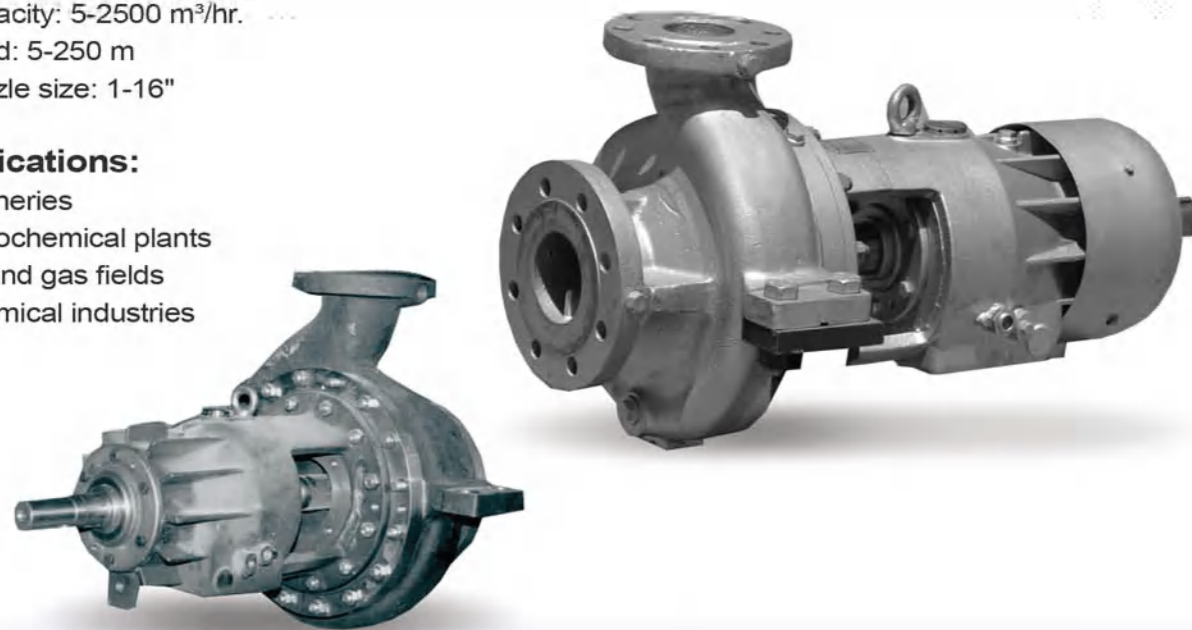
- Horizontal centrifugal OH2 design.
 - Single stage, single suction, dynamically balanced double shrouded impeller.
 - C.W. direction of rotation viewed from coupling.
 - Single or double volute, Radial split, Centerline mounted case.
 - Different sizes in 1500rpm and 3000rpm rated speed.
 - Mechanical seal chamber dimensions in full compliance with API 682 standard.
 - 4 sizes of bearing housing cover. Equipped with constant level sight feed oilers.
- The bearing housing is equipped with replaceable labyrinth seals with internal deflector to prevent contamination by moisture, dust and other foreign matters.
- Fan cooling and fined bearing bracket. In high temperature services cooling plans acc. to annex B of API 610Ed. 10 is applicable as an option.
 - Anti friction bearings with an operating time more than 25000h with ring oil lubrication.
 - Material is compatible with the fluid and acc. to annex H of API 610 standard.
 - Standard ANSI 300# RF flanges. Other ratings are possible as an option.
 - End – Top nozzle arrangement.
 - Low shaft deflection and long life.
 - Removable wearing at case and impeller. Running clearances meet the requirements of API 610 standard.
 - Automatic self vent and socket welded flanged drain.

Performance range:

- Capacity: 5-2500 m³/hr.
- Head: 5-250 m
- Nozzle size: 1-16"

Applications:

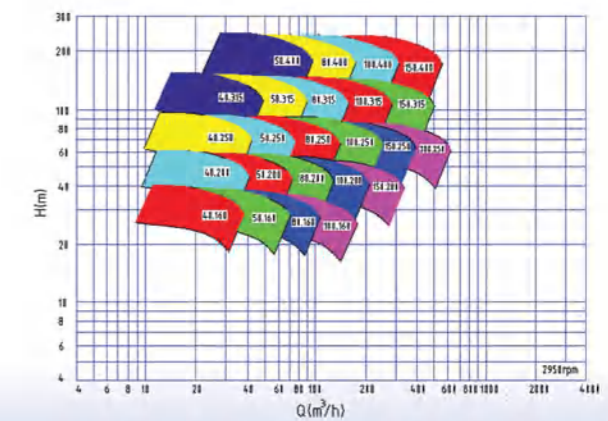
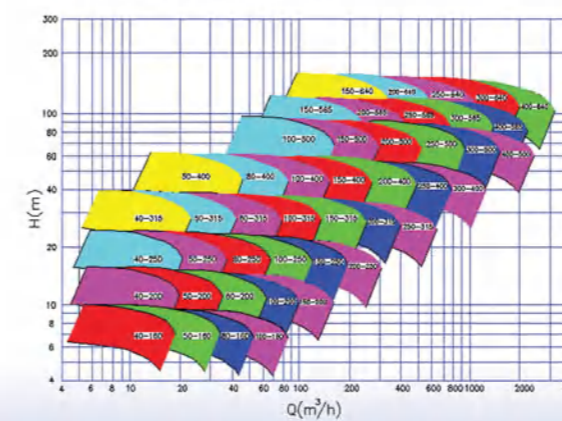
- Refineries
- Petrochemical plants
- Oil and gas fields
- Chemical industries



API 610 STANDARD

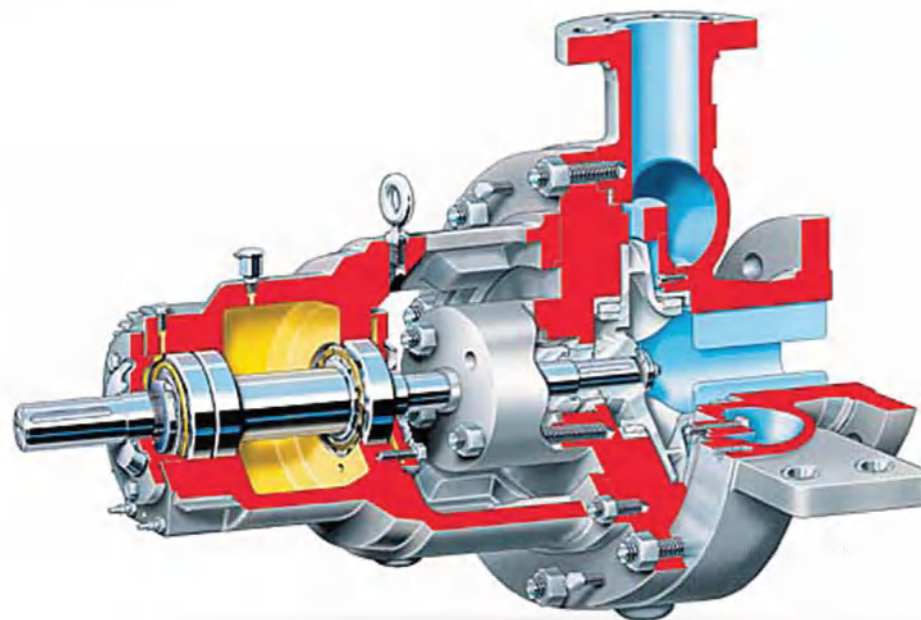
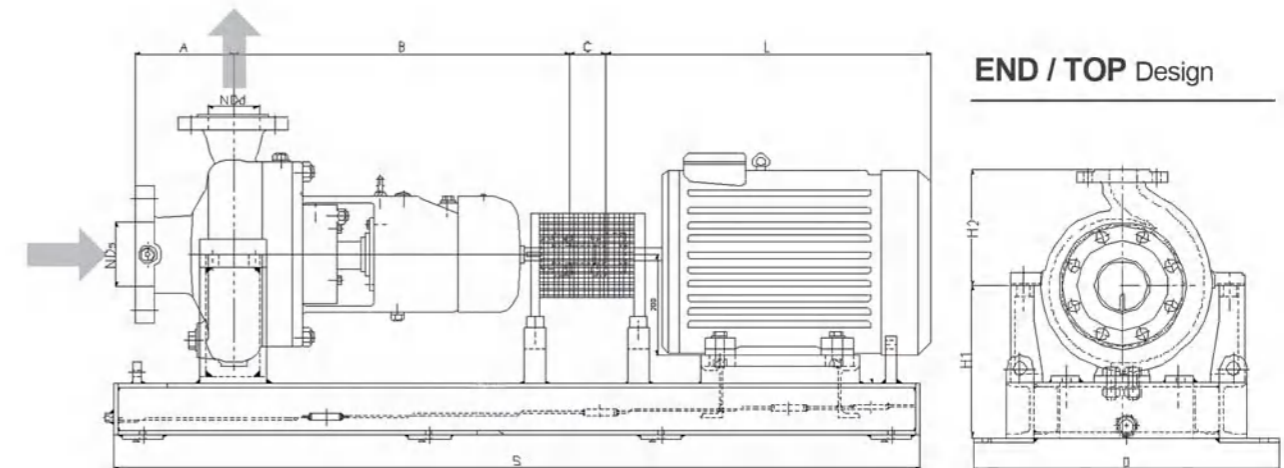


Family Diagram





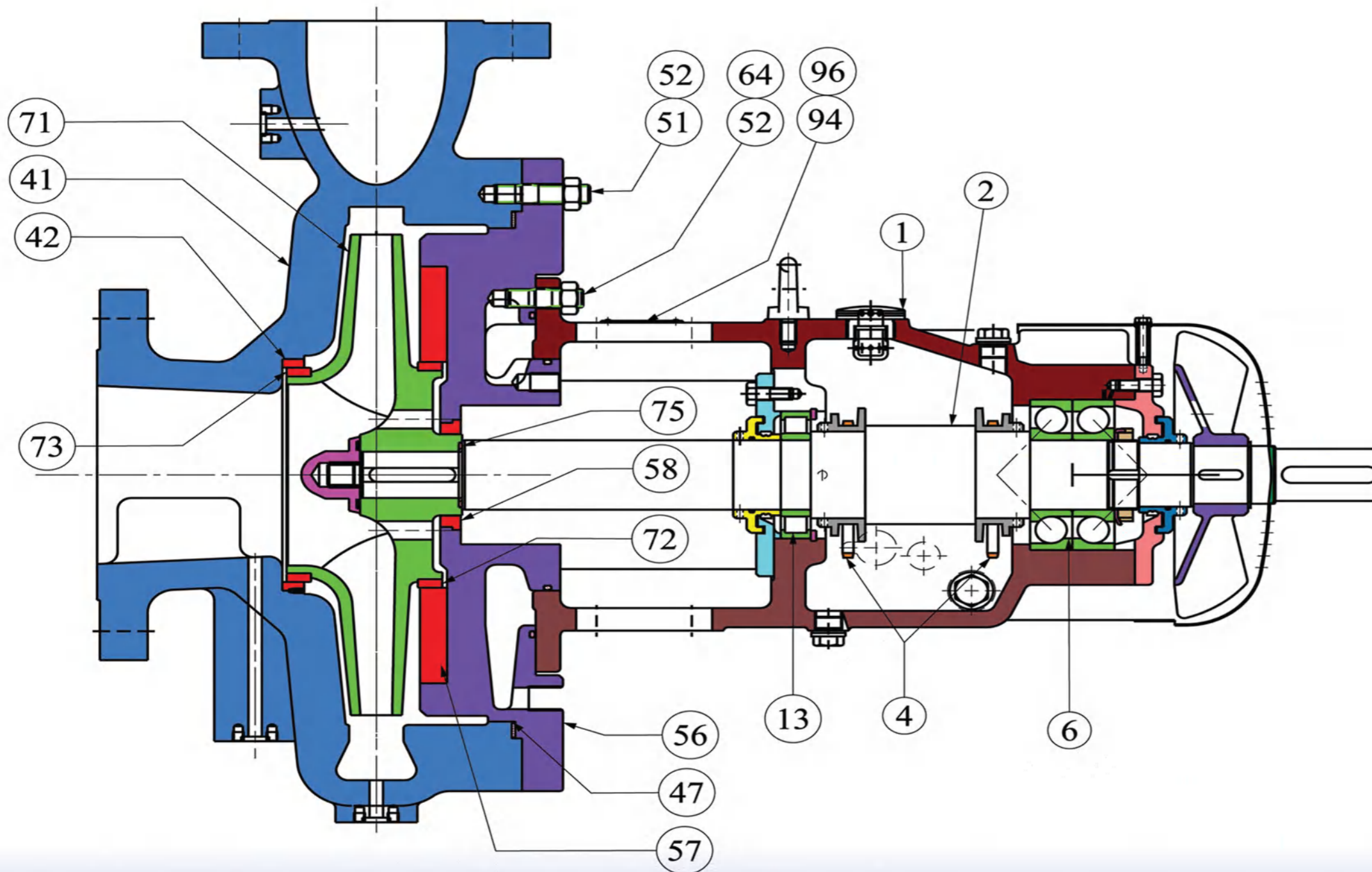
CP PUMPS



Size	DNs	DNd	A	B	H2	Size	DNs	DNd	A	B	H2
CP-25.200	50	25	109	539	200	CP-150.400	200	150	230	960	465
CP-25.250	50	25	180	637	300	CP-150.500	200	150	250	960	515
CP-25.315	50	25	180	637	300	CP-150.565	200	150	280	960	560
CP-40.160	80	40	140	635	170	CP-150.640	200	150	325	960	640
CP-40.200	80	40	145	635	210	CP-200.250	250	200	225	730	380
CP-40.250	80	40	155	635	250	CP-200.315	250	200	215	960	450
CP-40.315	80	40	180	635	320	CP-200.400	250	200	240	960	530
CP-50.160	80	50	140	630	195	CP-200.500	250	200	265	960	575
CP-50.200	80	50	150	630	210	CP-200.565	250	200	300	960	575
CP-50.250	80	50	165	630	260	CP-200.640	250	200	350	1200	675
CP-50.315	80	50	185	630	320	CP-250.315	300	250	235	960	480
CP-50.400	80	50	200	630	400	CP-250.400	300	250	255	960	565
CP-80.160	100	80	150	600	205	CP-250.500	300	250	280	1200	655
CP-80.200	100	80	150	630	240	CP-250.565	300	250	325	1200	650
CP-80.250	100	80	165	730	270	CP-250.640	300	250	370	1200	740
CP-80.315	100	80	190	720	320	CP-300.400	350	300	260	1200	605
CP-80.400	100	80	210	730	400	CP-300.500	350	300	270	1200	700
CP-100.160	150	100	150	630	220	CP-300.565	350	300	280	1200	740
CP-100.200	150	100	170	730	255	CP-300.640	350	300	395	1200	840
CP-100.250	150	100	200	730	340	CP-400.500	450	400	280	1200	745
CP-100.315	150	100	195	720	370	CP-400.565	450	400	290	1200	790
CP-100.400	150	100	220	730	415	CP-400.640	450	400	410	1200	900
CP-100.500	150	100	240	960	500						
CP-150.200	200	150	180	730	310						
CP-150.250	200	150	210	730	355						
CP-150.315	200	150	205	725	420						

All Dimentions are approximatly

CP PUMPS SECTIONAL



1	Bearing Bracket
2	Shaft
4	Oil Ring
6	Angular Contact Ball Bearing
13	Roller Bearing
41	Volute Casing
42	Casing Wear Ring
47	Gasket
51	Double End Stud
52	Hex Nut
53	Taper Pin
56	Delivery Cover
57	Del. Cov. Wear Ring
58	Del. Cov. Wear Ring
60	Screw Plug
64	Double End Stud
71	Impeller
72	Imp. Wear Ring
73	Imp. Wear Ring
74	Gasket
75	Gasket
76	Imp. Nut
77	Coil Insert
94	Open End Blind Rivet
96	Plaque Plate
Gr.	Name

FLUENT ANALYSIS



- Contours of Static Pressure (pascal)
- ANSYS Fluent Release 16.0 (3d,pbns, rke)



VIS PUMPS



VIS PUMPS

PETCO VIS PUMPS (acc. to latest ed. of API610 standard):

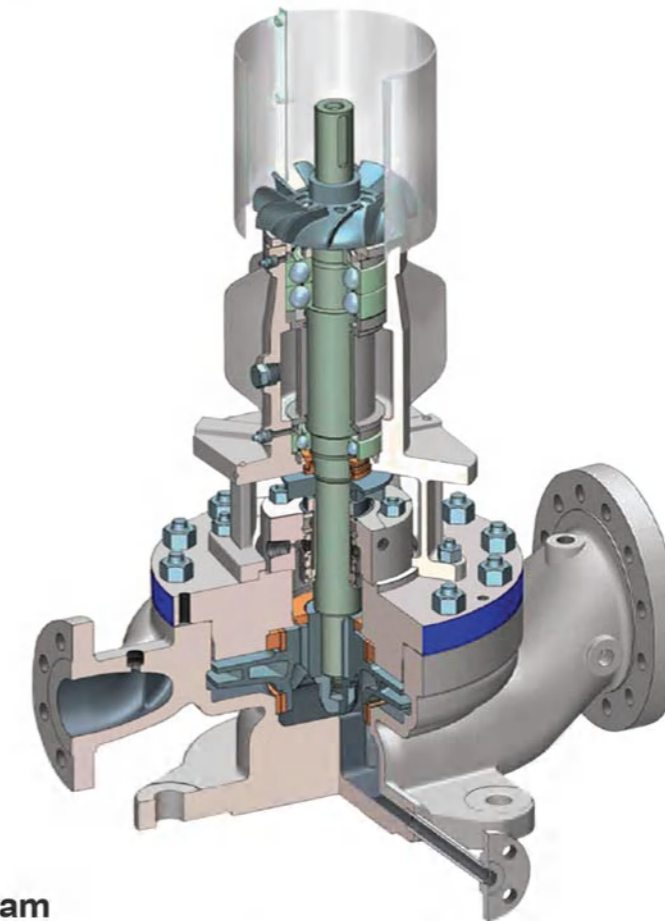
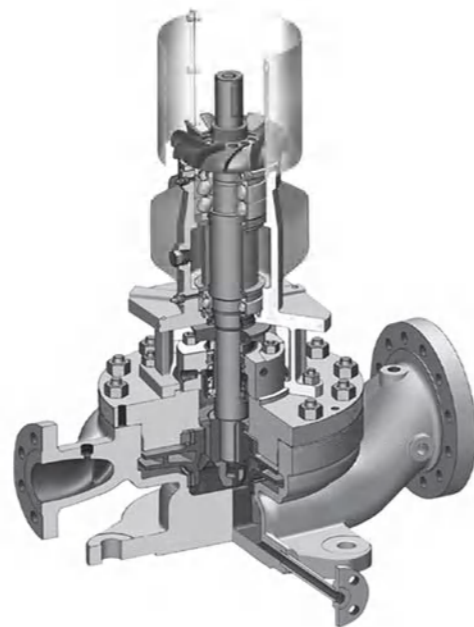
- Horizontal centrifugal OH3 design.
- Single stage, single suction impeller, dynamically balanced double shrouded impeller.
- Single or double volute, Radial split, Foot mounted case.
- Different sizes in 1500rpm and 3000 rpm rated speed.
- Mechanical seal chamber dimensions in full compliance with API682 standard.
- 4 sizes of bearing housing cover
- Anti friction bearings with an operating time more than 25000h with oil or grease lubrication.
- Material is compatible with the fluid and acc. to annex H of API610 standard.
- Standard ANSI 300# RF flanges. Other ratings are possible as an option.
- Side – Side nozzle arrangement.

Performance range:

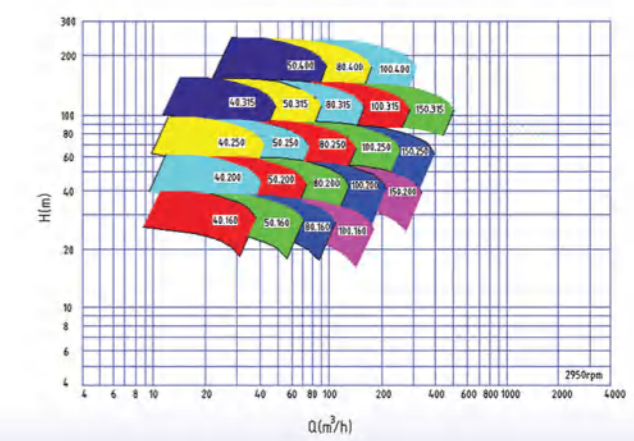
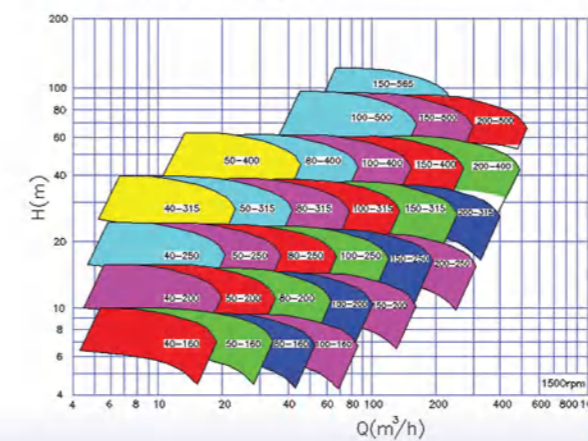
- Capacity: 5-500 m³/hr.
- Head: 5-250 m
- Nozzle size: 1-8"

Applications:

- Refineries
- Petrochemical plants
- Petroleum distribution plants
- Chemical industries

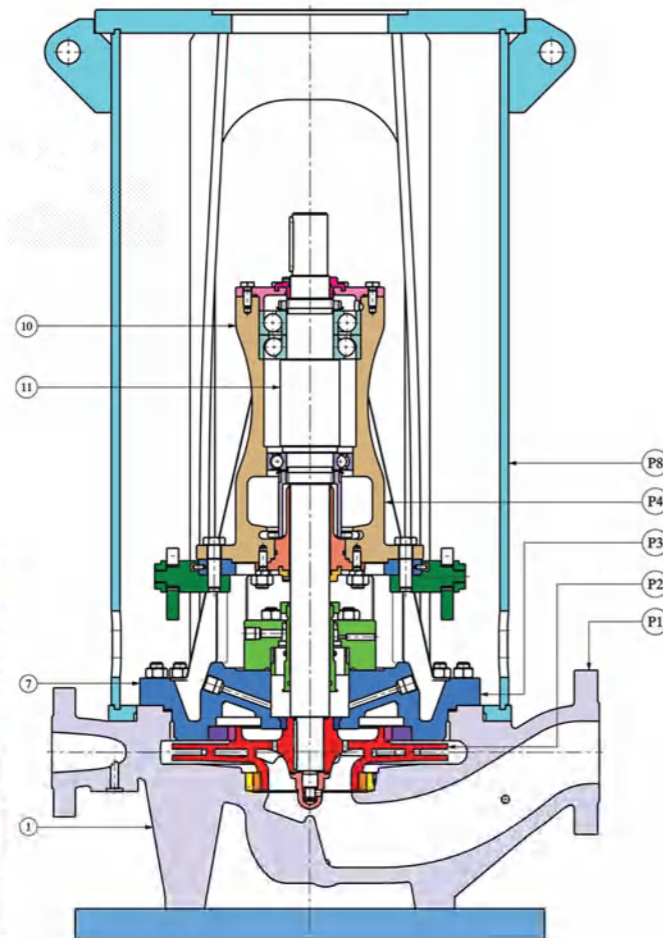


Family Diagram



RELIABILITY ENHANCEMENT CAPABILITIES

VIS PUMPS SECTIONAL



Bill of Material: P1 Volute Casing Assembly		
Number	Definition	Quantity
1	Volute Casing	1
2	Volute Casing Wear Ring	1
3	Hexagon Socket Set Screw	3

Bill of Material: P2 Impeller Assembly		
Number	Definition	Quantity
3	Hexagon Socket Set Screw	6
4	Impeller	1
5	Impeller Wear Ring D.S.	1
6	Impeller Wear Ring S.S.	1

Bill of Material: P3 Stuffing Box Assembly		
Number	Definition	Quantity
3	Hexagon Socket Set Screw	6
7	Stuffing Box	1
8	Stuffing Box Bushing	1
9	Stuffing Box Wear Ring	1

Bill of Material: P4 Bearing Bracket Assembly		
Number	Definition	Quantity
10	Bearing Bracket	1
11	Shaft	1
12	Angular Contact Ball Bearing	2
13	Bearing Nut Lock Washer	2
14	Bearing Nut	1
15	Deep Groove Ball Bearing	1

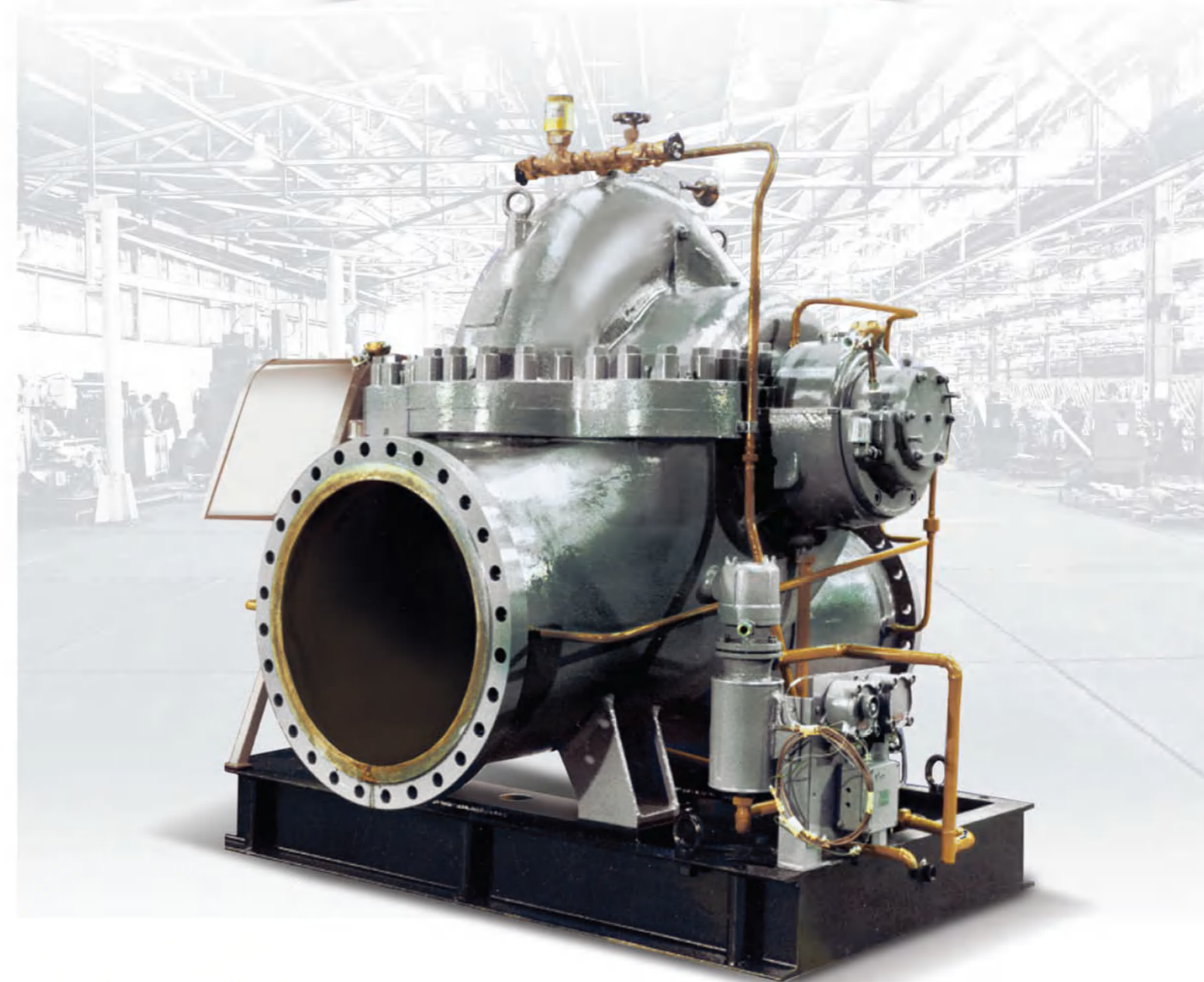
Bill of Material: P5 Back Pullout Assembly		
Number	Definition	Quantity
16	Oil Ring	1
17	Spiral Term	1
18	Parallel Key	1
19	Parallel Key	1
20	Dowel Pin	1
21	O-Ring	1
22	Bearing Cover D.S.	1
23	Hex Head Bolt	10
24	O-Ring	2
25	Deflector D.S.	1
26	Hexagon Socket Set Screw	6
27	O-Ring	1
28	Bearing Cover P.S.	1
29	Deflector P.S.	1

Bill of Material: P6 Left Repair System Pivot Assembly		
Number	Definition	Quantity
40	Repair System Pivot Right	1
41	Repair System Pivot Bush	2

Bill of Material: P7 Right Repair System Pivot Assembly		
Number	Definition	Quantity
41	Repair System Pivot Bush	2
42	Repair System Pivot Left	1

Bill of Material: P8 Driver Spacer Assembly		
Number	Definition	Quantity
30	Double End Stud	4
31	Mechanical Seal	1
32	Hex Nut	10
33	Hex-Head Bolt	6
34	Spiral Term	1
35	Impeller Nut	1
36	Hexagon Socket Set Screw	3
37	Repair System Hook	2
38	Repair System Bush	2
39	Repair System Nut	2

BS1 / BS2 PUMPS



PETCO BS1/BS2 Pumps (acc. to latest ed. of API 610 standard):

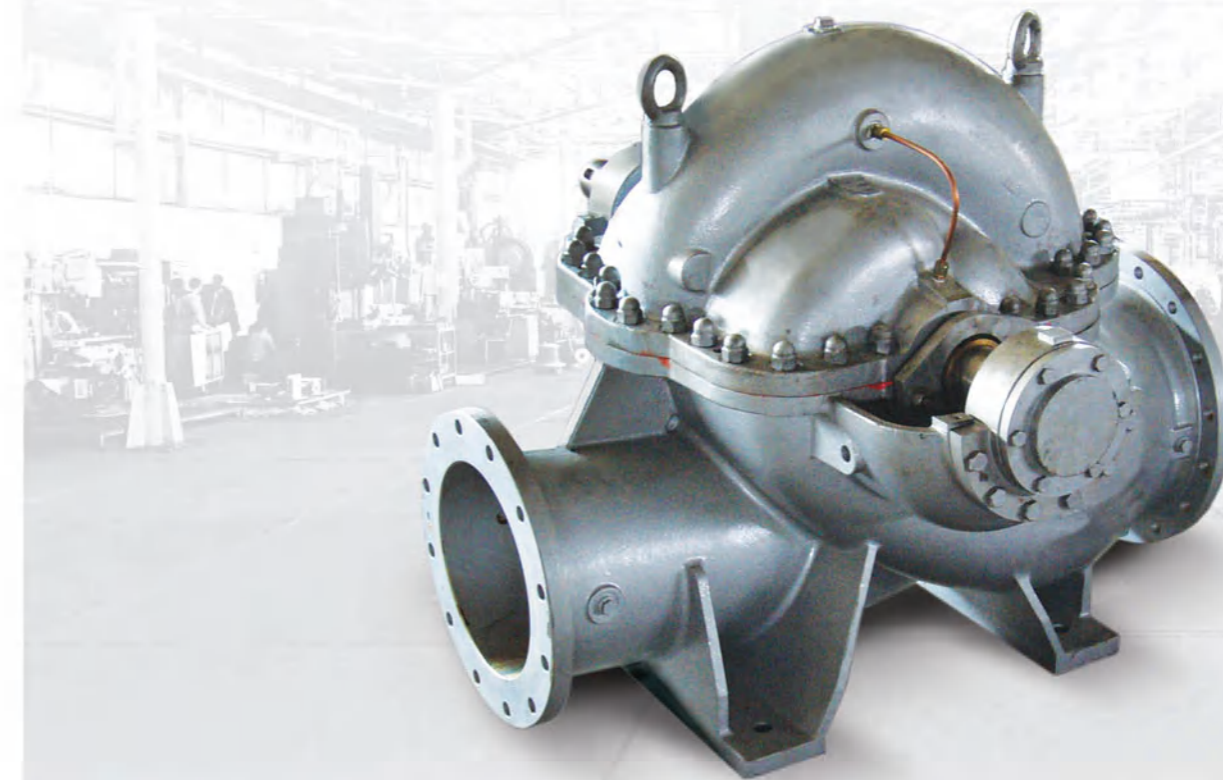
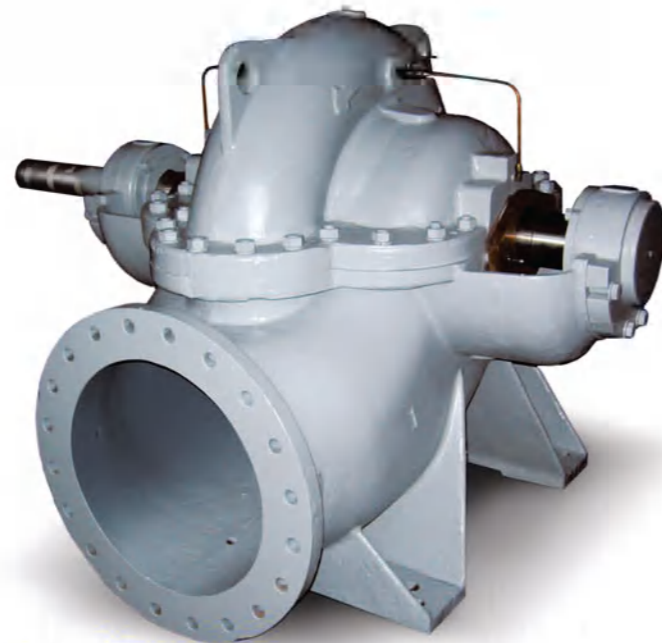
- Horizontal centrifugal BB1 design.
- Single stage, double suction, dynamically balanced double shrouded impeller (BS1).
- Two stage, single suction, dynamically balanced double shrouded impeller (BS2).
- C.W. and C.C.W. direction of rotation viewed from coupling.
- Different sizes in 1000rpm , 1500 RPM and 3000 RPM rated speed.
- Mechanical seal chamber dimensions in full compliance with API 682 standard.
- Cooling plans acc. to annex B of API 610Ed. 10 is applicable as an option.
- Anti friction bearings with an operating time more than 25000h .
- Oil , ring oil and grease lubrication methods.
- Material is compatible with the fluid and acc. to annex H of API 610 standard.
- Standard ANSI 150# RF flanges. Other ratings are possible as an option.
- SIDE - SIDE nozzle arrangement.
- Low shaft deflection and long life.
- Removable wearing at case and impeller. Running clearances meet the requirements of API 610 standard.
- Equipped with vent valve and socket welded flanged drain.

Performance range:

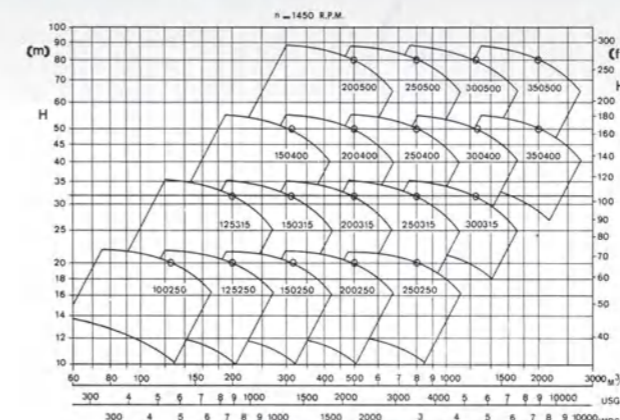
- Capacity: 50-8000m³/hr.
- Head: 15-250m
- Nozzle size:4-30"

Applications:

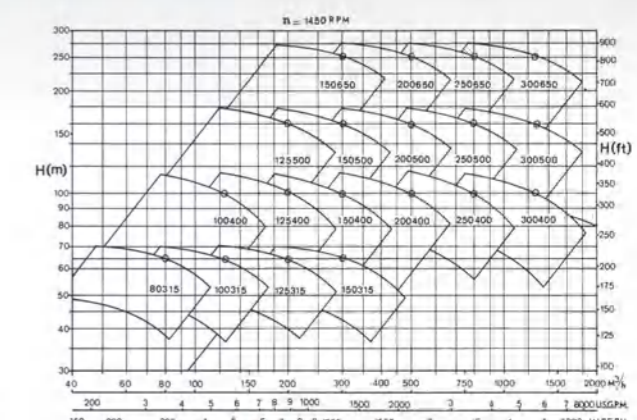
- Refineries
- Petrochemical plants
- Oil and gas fields
- Cooling and hot water systems
- Seawater handling
- Pipe lines



• Family Diagram



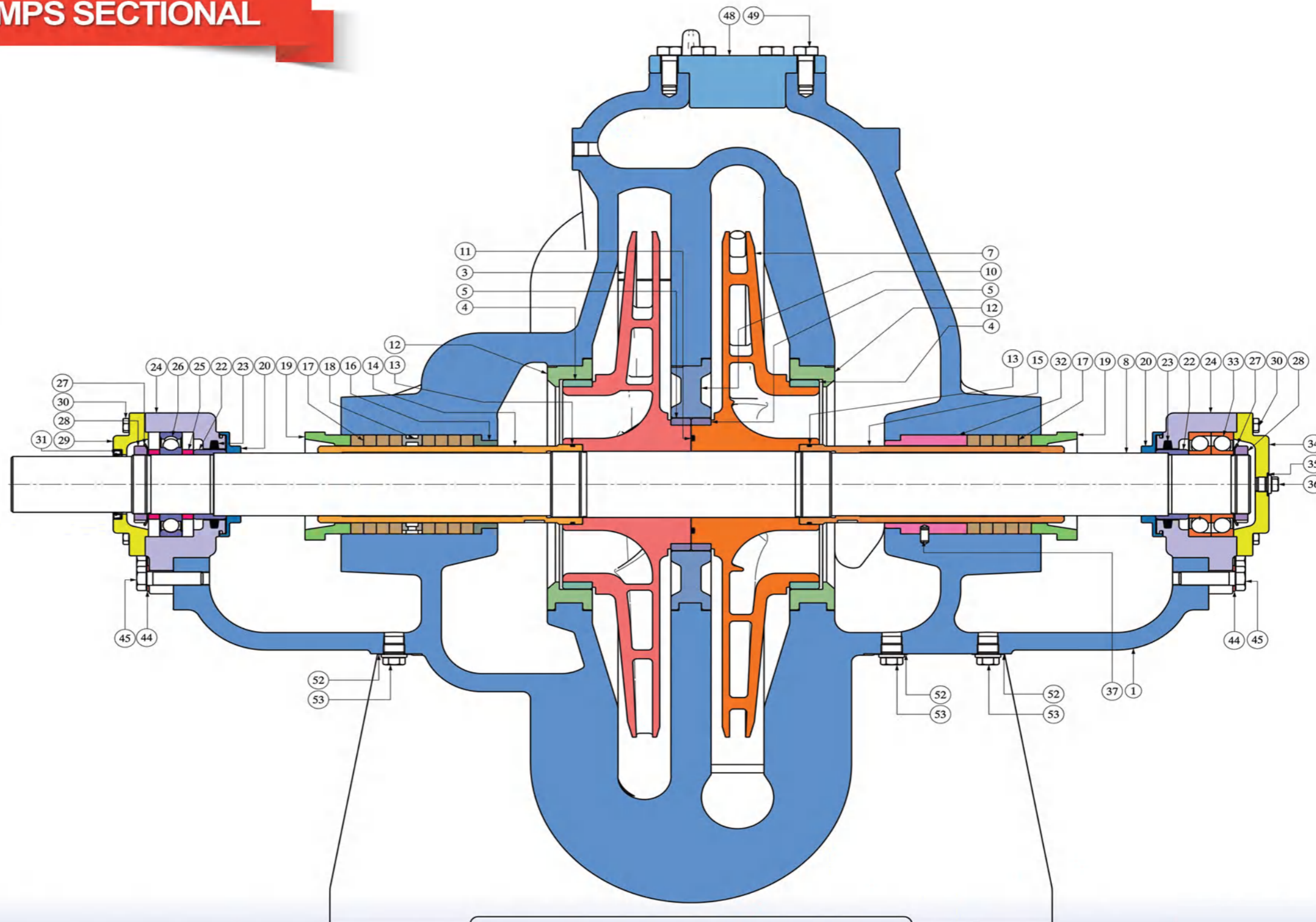
BS1 Series

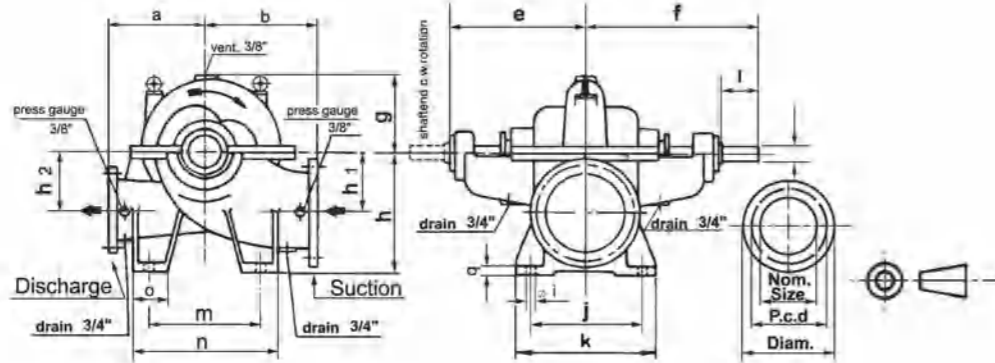


BS2 Series

BS2 PUMPS SECTIONAL

Bill of Material: P01		
Number	Definition	Quantity
1	Casing half-Lower	1
2	Casing half-Upper	1
Bill of Material: P02		
Number	Definition	Quantity
3	Impeller First Stage	1
4	Impeller Wear Ring S.S.	1
5	Impeller Wear Ring H.S.	1
6	Hexagon Socket Set Screw	6
Bill of Material: P03		
Number	Definition	Quantity
4	Impeller Wear Ring S.S.	1
5	Impeller Wear Ring H.S.	1
6	Hexagon Socket Set Screw	6
7	Impeller Second Stage	1
Bill of Material: P04		
Number	Definition	Quantity
P02	Impeller First Stage Assembly	1
P03	Impeller Second Stage Assembly	1
8	Shaft	1
9	Parallel Key	1
10	Intermediate Disc	1
11	O-Ring	1
12	Casing Wear Ring	2
13	O-Ring	2
14	Shaft Sleeve Left Thread	1
15	Shaft Sleeve Right Thread	1
16	Neck Bush S	1
17	Packing	1
18	Lantern Ring	1
19	Gland	2
20	Thrower	2
21	Hex. Socket Set Screw With Cup Point	6
22	Shoulder Ring	2
23	Felt Ring	2
24	Bearing Housing	2
25	Bearing Spacer	2
26	Deep Groove Ball Bearing	1
27	Bearing Nut Lock Washer	2
28	Bearing Nut	2
29	Bearing Cover D.S	1
30	Hex. Head Screw	12
31	Lip Seal	1
32	Neck Bush D	1
33	Angular Contact Ball Bearing	2
34	Bearing Cover	1
35	Sealing Washer	1
36	Hex. Head Screw Plug	1
Bill of Material: P05		
Number	Definition	Quantity
P04	Rotor Assembly	1
1	Casing half-Lower	1
2	Casing half-Upper	1
35	Sealing Washer	3
36	Hex. Head Screw Plug	3
37	Parallel Pin	1
38	Double End Stud	30
39	Tapper Pin With External Thread	2
40	Hex. Nut	2
41	Washer	30
42	Hex. Diamond Cap Nut	30
43	Hex. Head Screw	2
44	Washer	14
45	Hex. Head Screw	10
46	Double End Stud	4
47	Hex. Nut	4
48	Casing half-Upper Cup	1
49	Hex. Head Screw	6
50	Lifting Eyebolt	2
51	Parallel Key - DIN 6885	1
52	Sealing Washer	6
53	Hex. Head Screw Plug	6

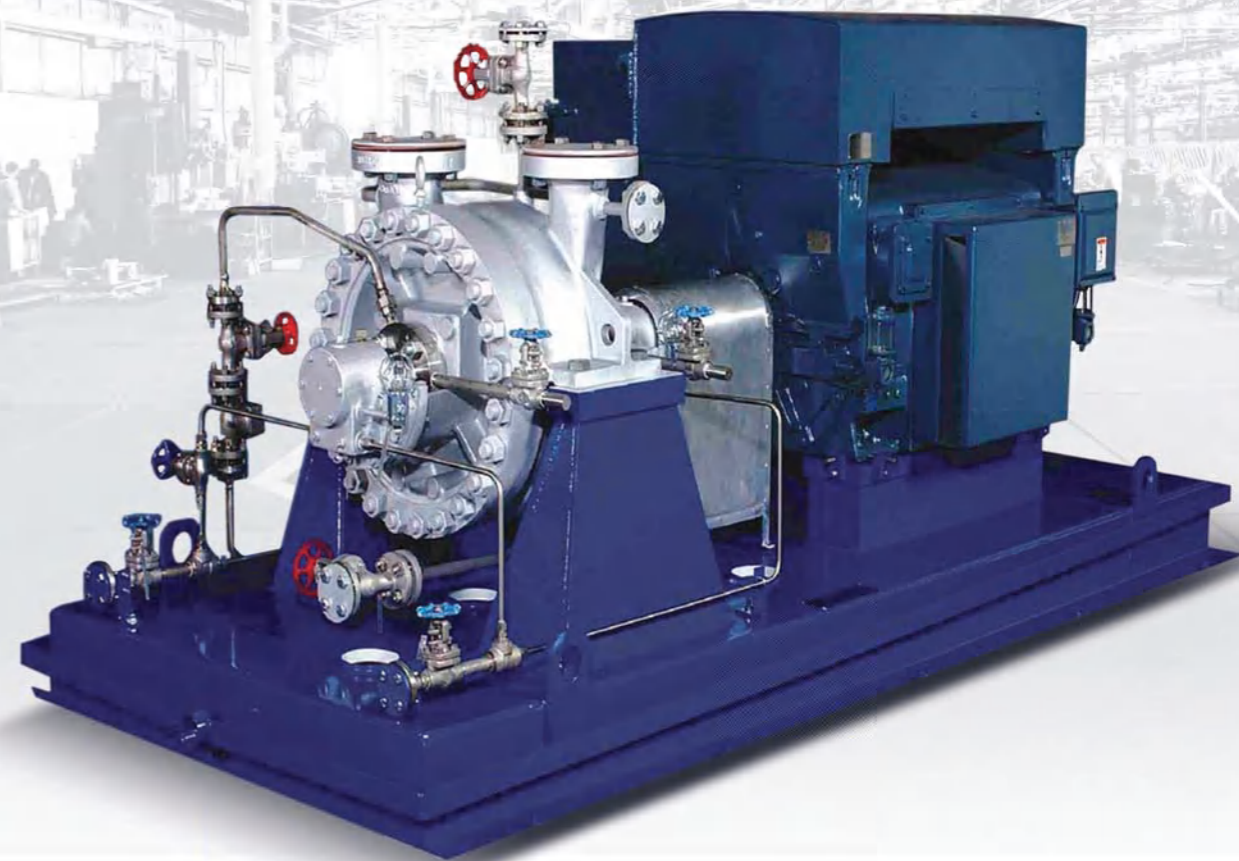




BT2 PUMPS

Type BSI	Dis.	Suc.	a	b	e	f	g	h	h ¹	h ²	Øi	j	k	m	n	o	q	Ød	l
1-250160	250	300	440	425	385	495	345	475	250	200	23	400	500	400	500	100	22	45	110
1-100250	100	125	275	300	385	470	200	280	150	155	23	270	325	325	400	75	22	38	80
1-125250	125	150	300	350	385	495	230	330	180	210	23	320	380	375	430	75	25	45	110
1-150250	150	200	300	400	385	495	270	375	180	210	23	375	430	375	430	75	25	45	110
1-200250	200	250	350	450	455	565	300	450	200	265	23	400	500	400	500	100	30	55	110
1-250250	250	300	450	500	525	645	275	530	275	275	27	525	650	525	650	125	27	65	120
1-300250	300	350	550	600	585	725	400	535	280	300	27	525	650	525	650	125	30	75	140
1-125315	125	150	355	395	385	495	255	330	180	200	23	375	430	375	430	90	25	45	110
1-150315	150	200	350	400	455	565	275	375	200	200	23	400	500	400	500	100	25	55	110
1-200315	200	250	400	450	525	645	320	425	200	250	27	450	550	450	550	100	27	65	120
1-250315	250	300	450	500	525	645	330	530	275	275	27	525	650	525	650	125	27	65	120
1-300315	300	350	500	600	585	725	380	585	325	360	30	580	700	580	700	125	30	75	140
1-350315	350	400	550	700	715	890	450	700	325	400	30	675	850	675	850	175	35	85	170
1-150400	150	200	400	400	455	565	320	400	225	250	23	400	500	400	500	100	25	55	110
1-200400	200	250	450	475	525	645	340	470	200	275	27	450	550	450	550	100	27	65	120
1-250400	250	300	450	500	525	645	340	530	300	300	27	525	650	525	650	125	27	65	120
1-300400	300	350	500	550	585	725	380	585	325	325	30	580	700	580	700	125	30	75	140
1-350400	350	400	550	650	715	890	450	650	325	380	30	675	850	675	850	175	35	85	170
1-400400	400	500	600	750	715	890	530	760	400	470	35	725	950	725	950	225	35	85	170
1-500400	500	600	750	900	970	1075	600	900	425	525	35	1000	1200	780	1000	225	40	100	210
1-200500	200	250	450	500	540	675	350	470	200	285	27	400	500	420	500	100	40	75	140
1-250500	250	300	500	550	585	725	400	525	250	325	27	525	650	525	650	125	30	75	140
1-300500	300	350	550	575	600	775	450	585	325	350	30	580	700	580	700	150	35	85	170
1-350500	350	400	600	675	755	965	500	675	325	385	33	675	850	675	850	175	35	100	210
1-400500	400	500	600	750	715	890	550	760	400	470	35	725	950	725	950	225	35	85	170
1-500500	500	600	650	850	825	1025	600	865	450	525	40	775	1000	775	1000	225	40	100	210
1-600500	600	700	700	950	825	1025	650	1000	500	600	40	850	1100	850	1100	250	45	100	210
1-250650	250	300	500	550	585	725	450	550	325	325	27	525	650	525	650	125	30	75	140
1-300650	300	350	650	650	600	775	520	675	325	425	33	580	700	580	700	150	35	85	170
1-350650	350	400	550	650	715	965	475	730	350	450	33	675	850	675	850	175	32	100	210
1-400650	400	500	650	800	825	1025	600	760	400	470	35	725	950	725	950	225	35	100	210
1-500650	500	600	700	850	825	1025	650	865	450	525	40	775	1000	775	1000	225	40	100	210
1-600650	600	700	700	1000	910	1125	675	1040	500	650	40	850	1100	850	1100	250	45	100	210
1-300800	300	350	800	750	755	965	620	730	325	500	33	675	850	675	850	175	35	100	210
1-350800	350	400	700	850	730	965	600	730	350	475	35	675	850	675	850	175	32	100	210
1-400800	400	500	800	825	730	930	740	775	400	475	35	565	740	900	1100	250	50	120	210
1-500800	500	600	750	950	910	1125	680	940	450	600	40	775	1000	775	1000	225	40	120	210
1-600800	600	700	750	1000	910	1160	730	1040	500	650	40	850	1100	850	1100	250	45	140	250

• All dimensions are approximately



PETCO BT2 Pumps (acc. to latest ed. of API 610 standard):

- Horizontal centrifugal BB2 design.
- Two stages, single suction, dynamically balanced double shrouded impellers.
- Single or double volute, Radial split, Centerline mounted case.
- Different sizes in 3000rpm rated speed.
- Mechanical seal chamber dimensions in full compliance with API 682 standard.
- 3 sizes of bearing housing cover. Equipped with constant level sight feed oilers. The bearing housing is equipped with replaceable labyrinth seals with internal deflector to prevent contamination by moisture, dust and other foreign matters.
- Fan cooling and fined bearing bracket. In high temperature services cooling plans acc. to annex B of API 610Ed. 10 is applicable as an option.
- Anti friction bearings with an operating time more than 25000h with ring oil lubrication.
- Material is compatible with the fluid and acc. to annex H of API 610 standard.
- Standard ANSI 300# RF flanges. Other ratings are possible as an option.
- Top – Top nozzle arrangement.
- Low shaft deflection and long life.
- Removable wearing at case and impeller. Running clearances meet the requirements of API 610 standard.
- Equipped with vent valve and socket welded flanged drain.

Performance range:

- Capacity: 10-400 m³/hr.
- Head: 100-500 m
- Nozzle size: 2-8"

Applications:

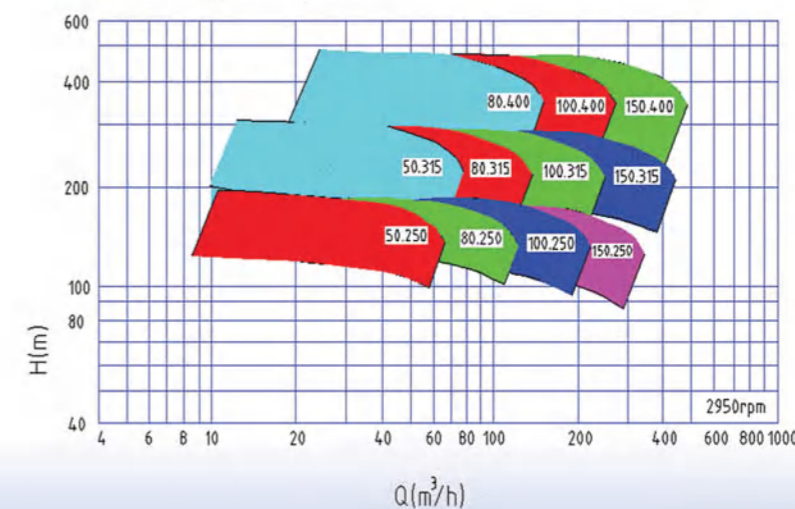
- Refineries
- Petrochemical plants
- Oil and gas fields
- Chemical industries



BT2 PUMPS

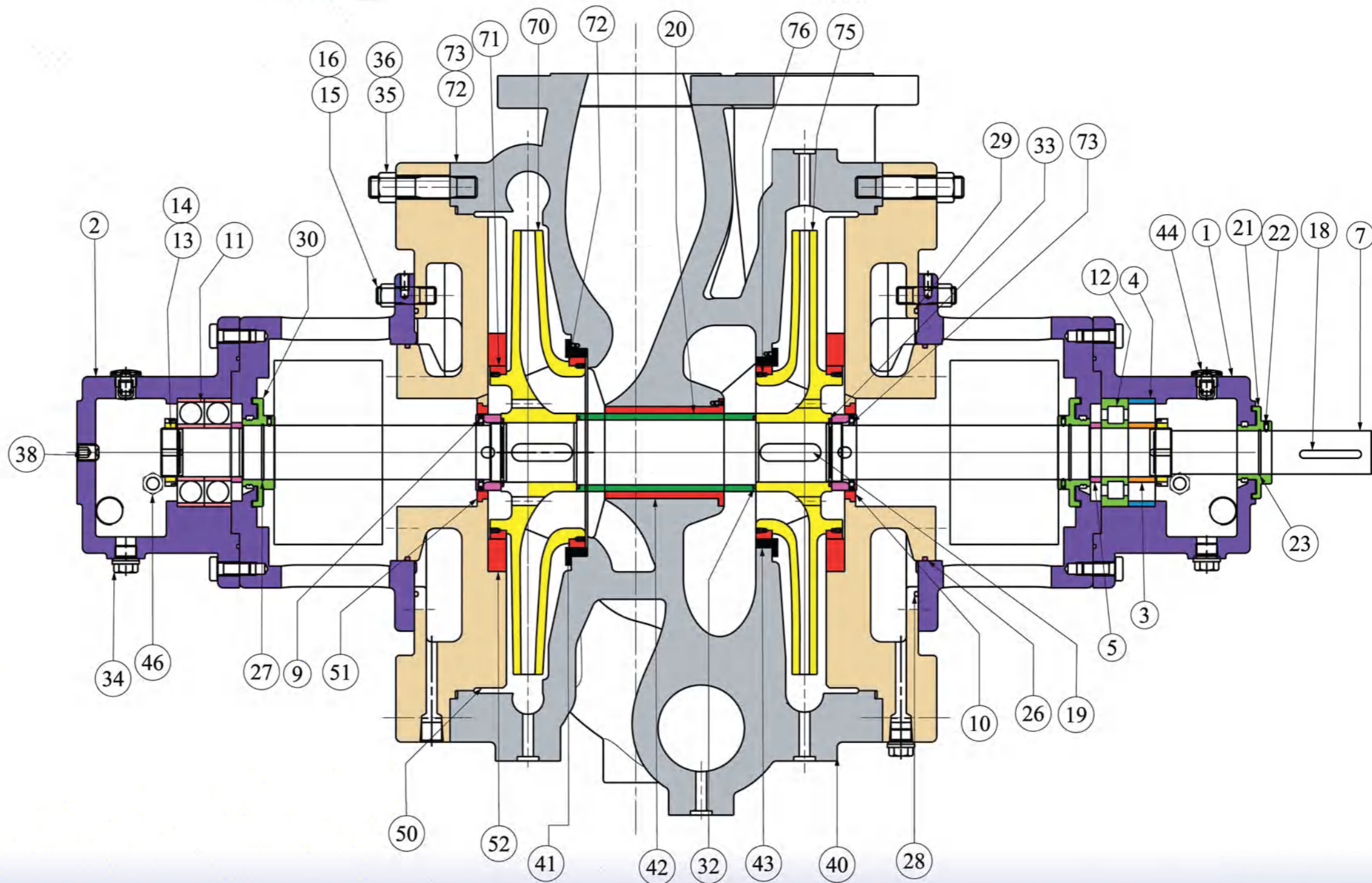


Family Diagram

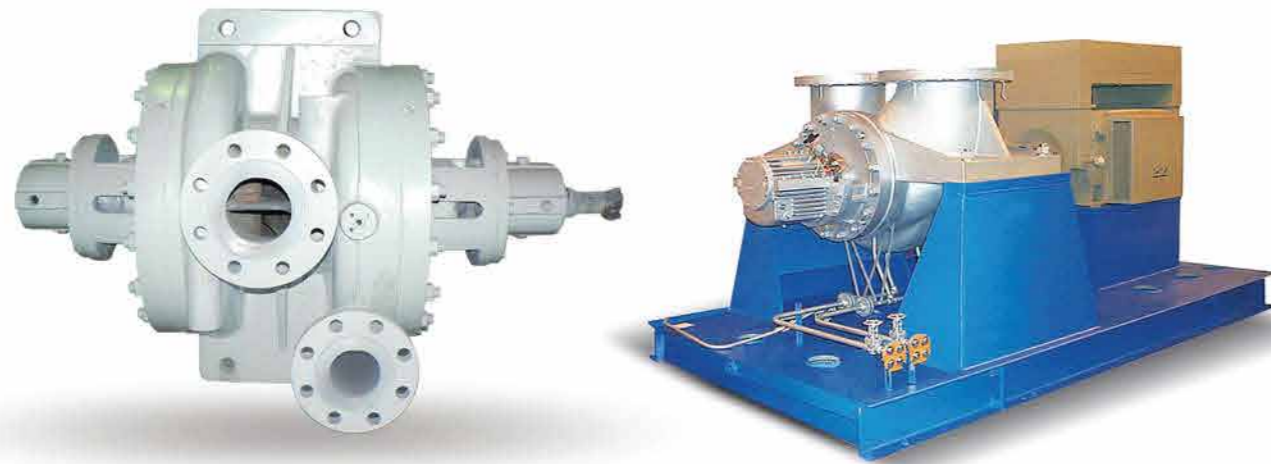


BT2 PUMPS SECTIONAL

94	Open End Blind Rivet
96	Plaue Plate
76	Imp. wear ring
75	Impeller(discharge)
73	Socket Set Screw cone point
72	Imp. wear ring
71	Imp. wear ring
70	Impeller(suction)
60	Hex Head Screw plug
52	Del. cover wear ring
51	Del. cover wear ring
50	Delivery Cover
46	Oil Gauge
44.3	Mesh
44.2	Bottom
44.1	Cover
44	Breather Ass.
43	Casing wear ring
42	Casing wear ring
41	Casing wear ring
40	Pump Casing
38	Socket Set Screw cup point
36	Hex Nut
35	Double End Stud
34	Magnetic Hex.Head Screw Plug
33	Gasket
32	Gasket
30	Deflector(PS)
29	Gasket
28	O-Ring
27	O-Ring
26	O-Ring
25	O-Ring
24.3	Constant Oil Level
24.2	Elbow 90° F-F
24.1	Hexagon Reducing Nipple
23	O-Ring
22	Socket Set Screw cone point
21	Deflector(DS)
20	Impeller spacer
19	Parallel Key
18	Parallel Key
17	Hex Head Bolt
16	Hex Nut
15	Double End Stud
14	Bearing Nut Lock Washer
13	Bearing Nut
12	Cylindrical Roller Bearing
11	Angular contact ball Bearings
10	Impeller lock (DS)
9	Impeller lock (DDS)
7	Pump Shaft
6	Spacer
5	Shaft collar
4	Bearing spacer
3	Shaft collar
2	Bearing cover (DDS)
1	Bearing cover (DS)
Item	Description



CPV PUMPS



RELIABILITY FOR PUMPING TECHNOLOGY

PETCO CPV Pumps (acc. to latest ed. of API 610 standard):

- Vertical centrifugal VS4 design.
- Single stage, single suction, dynamically balanced double shrouded impeller.
- Single or double volute, Radial split Case.
- Different sizes in 1500rpm
- 4 sizes of bearing housing cover. Equipped with constant level sight
- Pumped fluid lubricated rubber radial bearings. Oil and grease lubricated thrust bearings. External source lubrication is applicable as an option.
- Material is compatible with the fluid and acc. to annex H of API 610 standard.
- Standard ANSI 150# RF flanges. Other ratings are possible as an option.
- Bottom – Side nozzle arrangement.
- Low shaft deflection and long life.
- Removable wearing at case and impeller. Running clearances meet the requirements of API 610 standard.

Performance range:

- Capacity: 5-200 m³/hr.
- Head: 5-60 m
- Nozzle size: 2"-8"

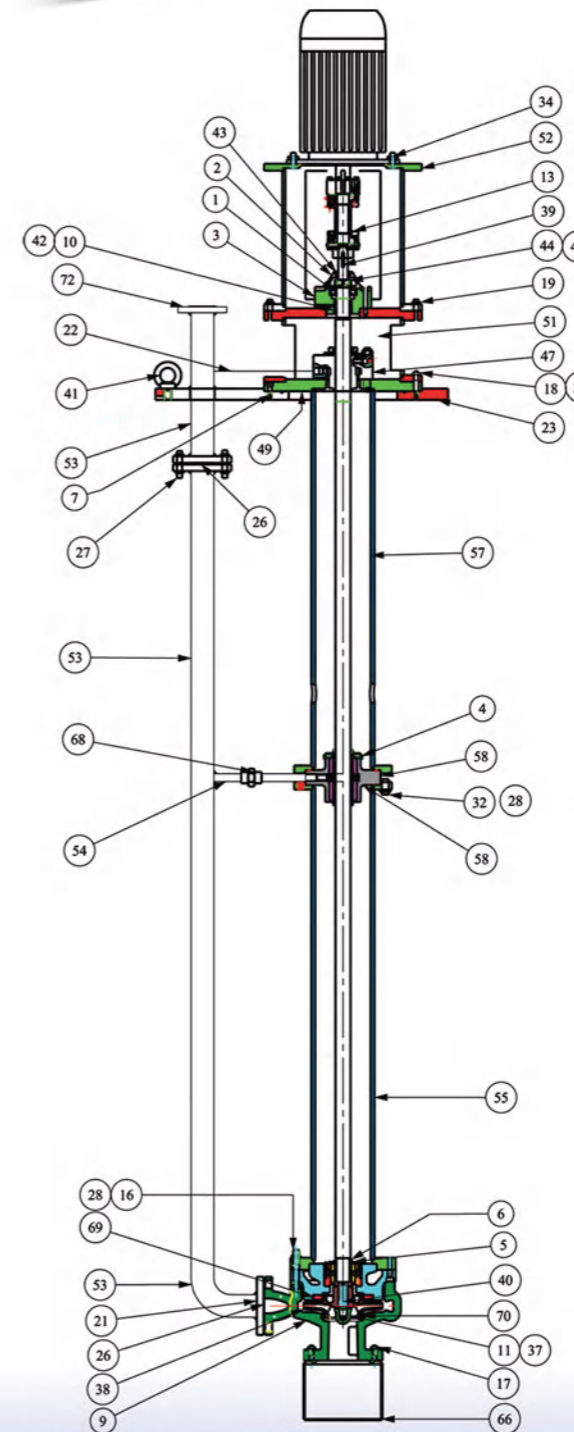
Applications:

- Refineries
- Petrochemical plants
- Water and waste water plants.
- Chemical industries
- Vessel services.



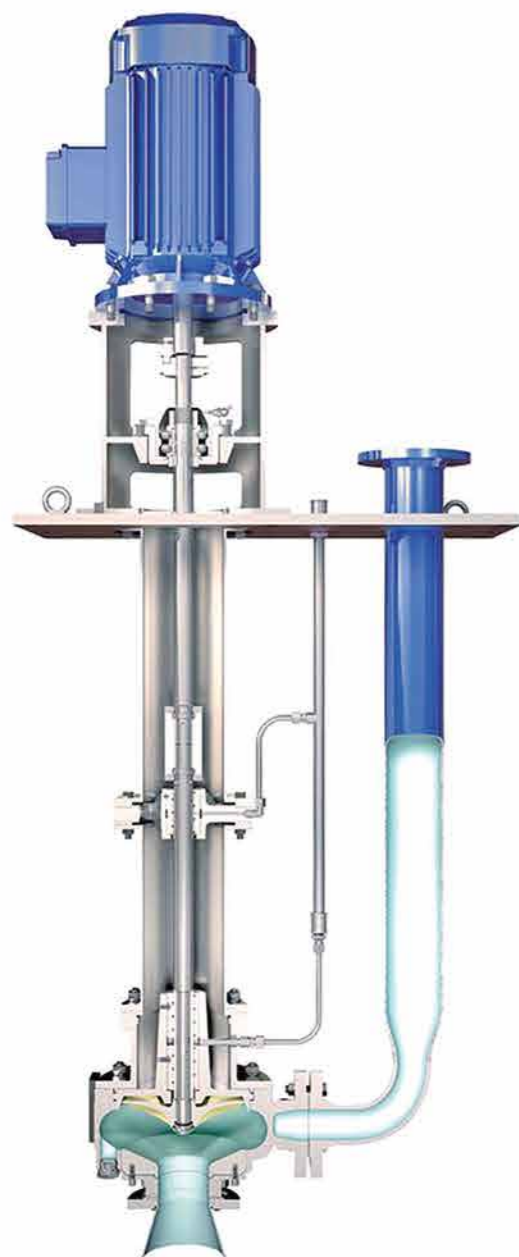
LONG LIFE AND SAFETY

CPV PUMPS SECTIONAL

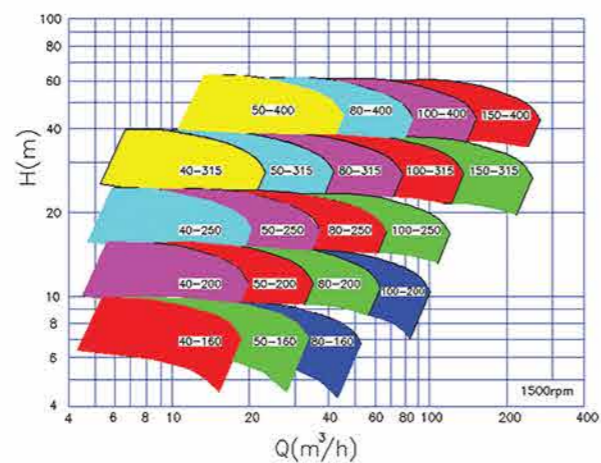


72	1	Flange DN40 Class150#
71	1	Wear Ring Imp.
70	1	Casing Wear Ring
66	1	Strainer Ass.
65	1	ShaftSleeve
64	1	Shaft
58	1	Retainer
57	1	PipeColumn Ass.Upper
55	1	PipeColumn Ass.Lower
53	1	Pipe
52	1	Pedstal DriverUpper Ass
51	1	Pedstal DriverLower Ass
45	1	Lock Washer
44	1	Lock Nut
43	1	Lip Seal
42	2	Lip Seal
41	2	Lifting Eyebolt
40	1	Key Imp.
39	1	Key
38	1	Impeller
37	1	Imp.Nut
34	4	Hex-Head Bolt
32	8	Hex-Head Bolt
27	8	Hex Nut
23	1	Frame
21	3	Flange
19	8	Double End Stud
18	10	Double End Stud
17	4	Doubl End Stud
16	8	Doubl End Stud
15.1	1	Delivery Cover
13	1	Coupling TSK0013
11	1	Coil Insert
9	1	Casing
6	1	Bush
5	1	Bush
4	1	Bearing Line Shaft
3	1	Bearing Housing
2	1	Bearing Cover
1	1	Ball Bearing
GR.	Qty	Description

CPV PUMPS



• Family Diagram



VDLA PUMPS



VDLA PUMPS

According to VS1 type of API 610 Standard (Latest ed.)

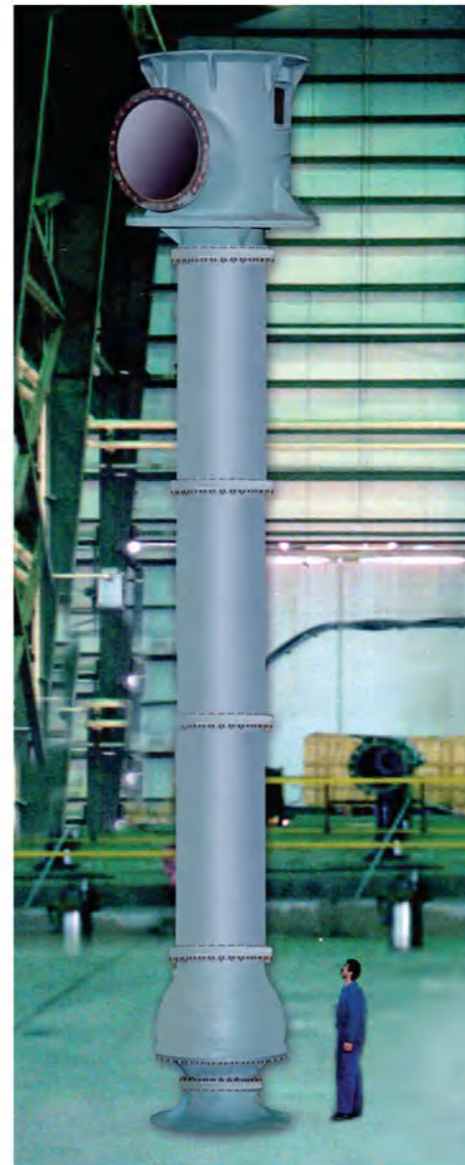
- Vertical turbine casing.
- Sigle/multi stage closed impeller in VDL and HVCPR Serise. Propeller type in VPL serise.
- Bellmouth suction in bottom and flaged discharge inside of above floor.
- Medium lubricated radial bearings/grease lubricated anti friction ball trust bearing.
- Packed gland shaft seal.
- Minimum shaft deflection.

Operating Data:

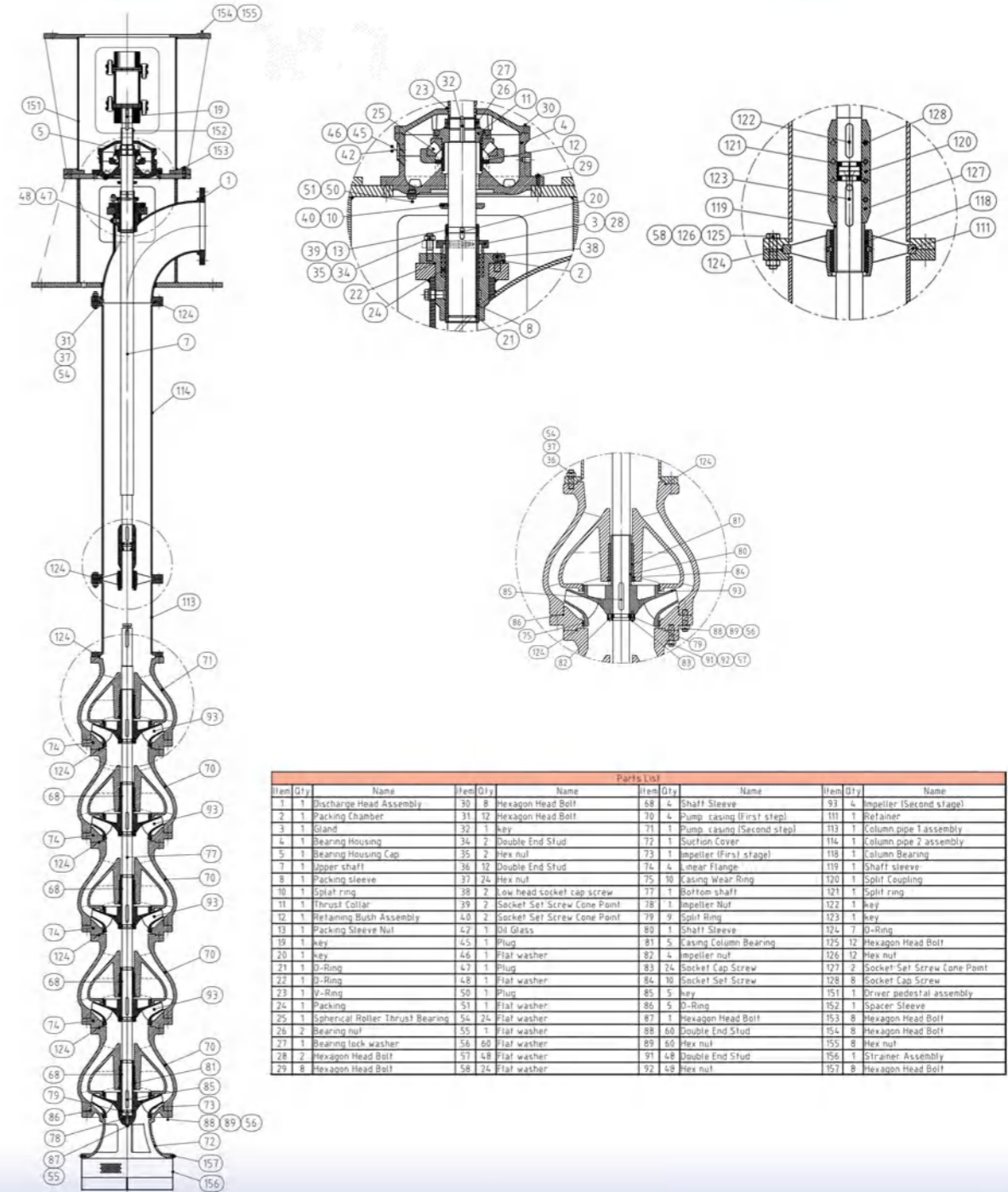
- Capacity: up to 20000 m³/h
- Total head: up to 200 m

Applications:

- Water industries.
- Water supply systems
- Cooling water intake systems.
- Sea water intake systems.



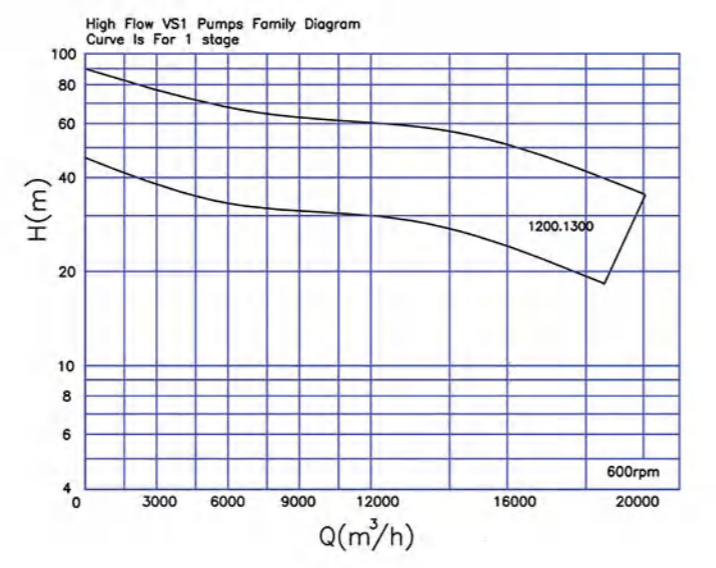
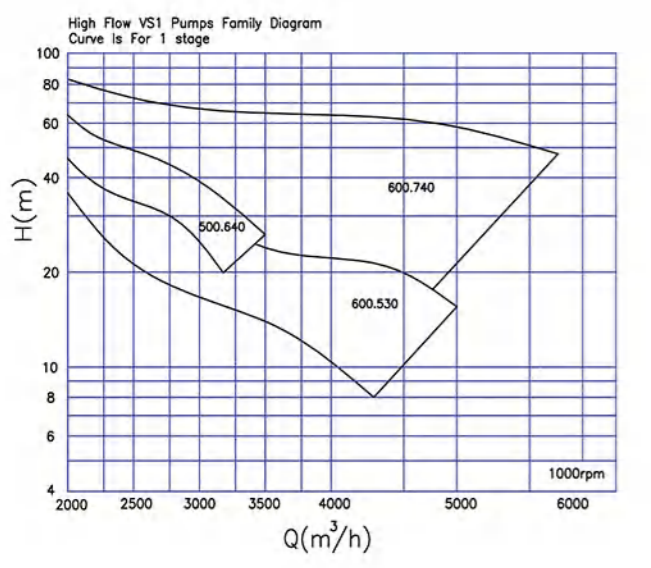
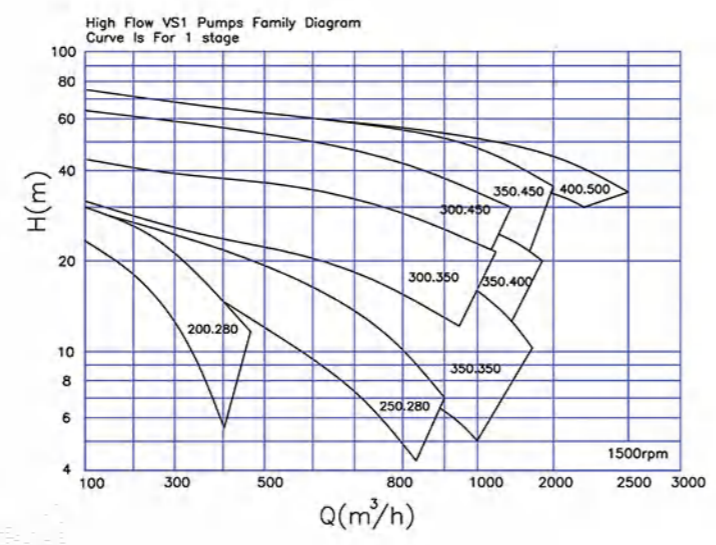
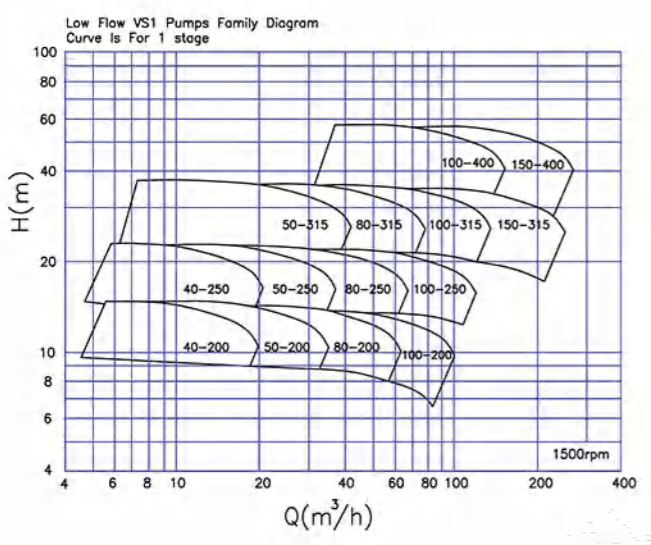
VDLA PUMPS SECTIONAL



Parts List					
Item Qty	Name	Item Qty	Name	Item Qty	Name
1	Discharge Head Assembly	30	Hexagon Head Bolt	68	Shaft Sleeve
2	Packing Chamber	31	Hexagon Head Bolt	70	Pump casing (first step)
3	Gland	32	Key	71	Pump casing (second step)
4	Bearing Housing	34	Double End Stud	72	Surf-Foot Cover
5	Bearing Housing Cap	35	Hex nut	73	Impeller (first stage)
7	Upper shaft	36	Double End Stud	74	Linear Flange
8	Packing sleeve	37	Hex nut	75	Casing Wear Ring
10	Split ring	38	Low head socket cap screw	77	Bottom shaft
11	Thrust Collar	39	Socket Set Screw Cone Point	78	Impeller Nut
12	Retaining Bush Assembly	40	Socket Set Screw Cone Point	79	Split Ring
13	Packing Sleeve Nut	42	Oil Glass	80	Shaft Sleeve
19	Key	45	Plug	81	Casing Column Bearing
20	Key	46	Flat washer	82	Impeller nut
21	O-Ring	47	Plug	83	Socket Cap Screw
22	O-Ring	48	Flat washer	84	Socket Set Screw
23	O-Ring	50	Plug	85	Key
24	Packing	51	Flat washer	86	O-Ring
25	Hydraulic Roller Thrust Bearing	54	Flat washer	87	Hexagon Head Bolt
26	Bearing nut	55	Flat washer	88	Double End Stud
27	Bearing lock washer	56	Flat washer	89	Hex nut
28	Hexagon Head Bolt	57	Flat washer	91	Double End Stud
29	Hexagon Head Bolt	58	Flat washer	92	Hex nut
				93	Impeller (second stage)
				94	Retainer
				95	Column Pipe 1 assembly
				96	Column Pipe 2 assembly
				97	Column Bearing
				98	Shaft sleeve
				99	Split Coupling
				100	Split ring
				101	Key
				102	O-Ring
				103	Hexagon Head Bolt
				104	Hex nut
				105	Socket Set Screw Cone Point
				106	Socket Cap Screw
				107	Socket Set Screw
				108	Key
				109	Driver pedestal assembly
				110	Spacer Sleeve
				111	Hexagon Head Bolt
				112	Hexagon Head Bolt
				113	Hexagon Head Bolt
				114	Hex nut
				115	Strainer Assembly
				116	Hexagon Head Bolt

BS3 PUMPS

Family Diagram



PETCO BS3 Pumps (acc. to latest ed. of API 610 standard):

Characteristic Data :

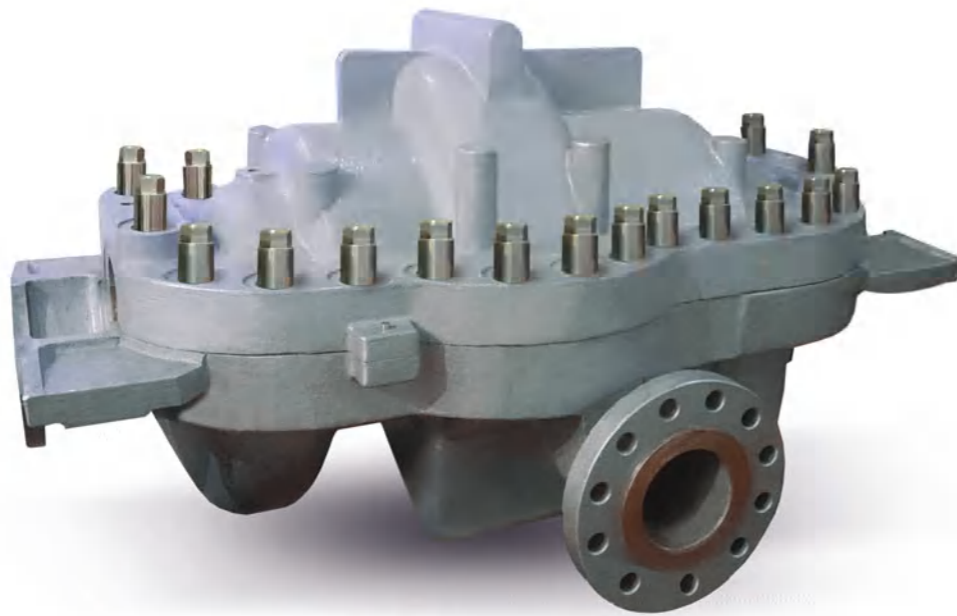
- API 610 Latest Edition (BB3 Type)
- Axially Split, Horizontal Multi-Stage Centrifugal Pump
- Centerline / Near Centerline Mounted
- Double Volute Casing
- Single Suction, Enclosed Impeller.
- Thrust Compensation By Opposed Impeller Groups
- Side-Side Nozzle Arrangement
- Materials of Construction as API 610
- Ring Oil Lubrication. Other Methods of Lubrication Available
- Replaceable Wear Rings For Casing And Impeller
- Sleeve / Tilt Pad Bearings Design Available
- Fan / Water Cooling Available

Applications :

- Refineries
- Petrochemical plants
- Oil fields
- Chemical plants
- Power plants
- Desalination plants
- Boiler feed water pumps

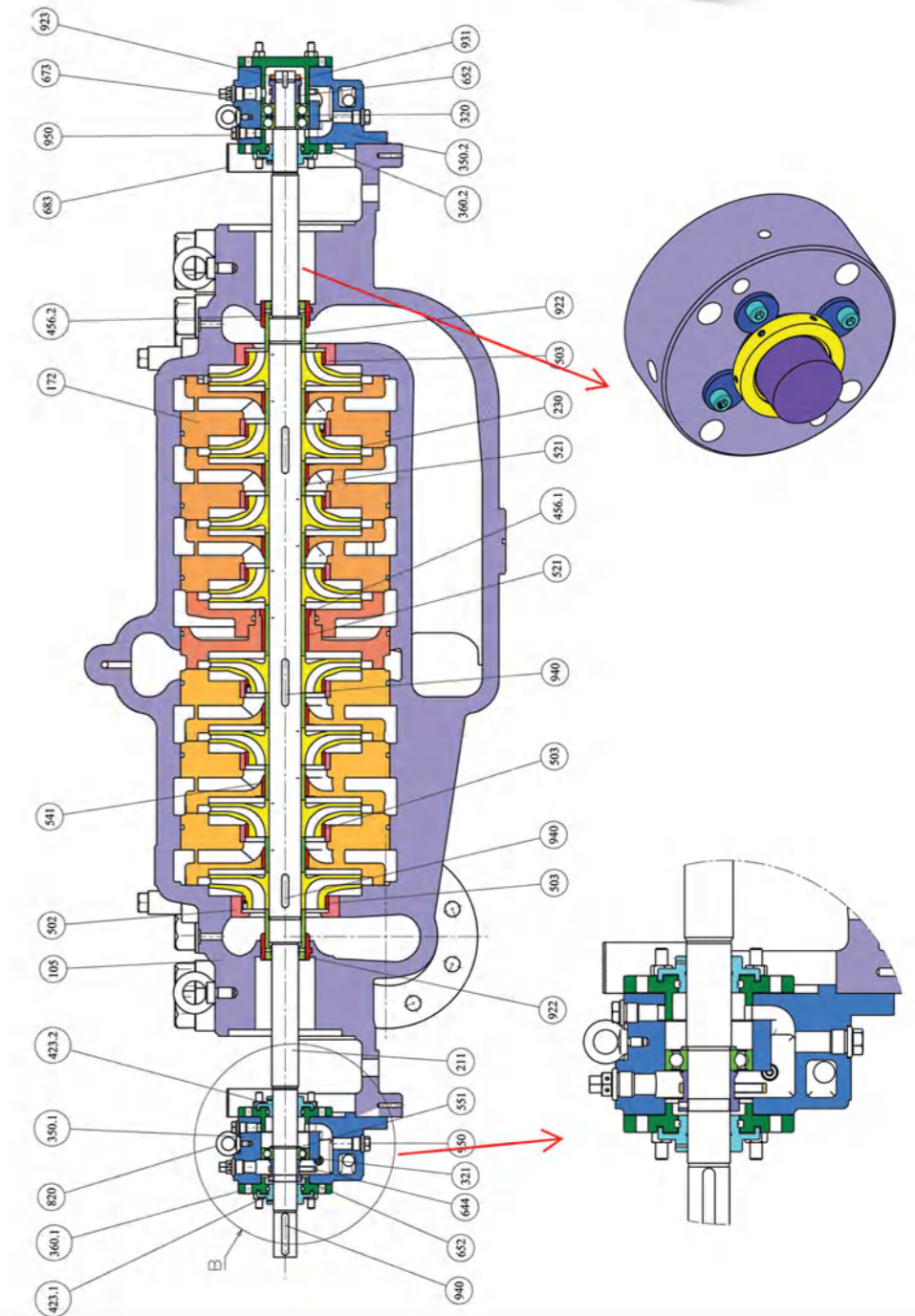
Performance Data :

- Capacity: 10 - 500 m³/hr.
- Head: 100 - 1000 m
- Temperature: to 250°C
- Discharge size: 1 1/2" to 14 "



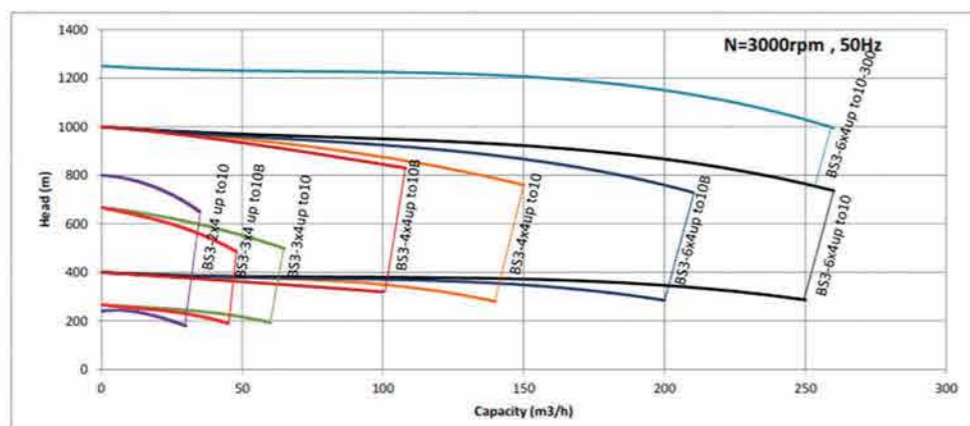
BS3 PUMPS SECTIONAL

Item	Name
105	Casing
172	Diffuser
211	Main shaft
230	Impeller
320	Ball Bearing
321	Radial ball bearing
350.1	Bearing housing (DS)
350.2	Bearing housing (NDS)
360.1	Bearing cover (DS)
360.2	Bearing cover (PS)
423.1	Deflector (DS)
423.2	Deflector (PS)
456.1	Diffuser wear ring
456.2	Stuffing box bushing
502	Casing wear ring
503	Impeller wear ring
521	Interstage sleeve
541	Diffuser wear ring
551	Disc spacer
638	Constant level oiler
642	Oil level sight glass
644	Lubricating ring
652	Lubricating sleeve
673	Vent filter
683	Cap
820	Eye bolt
922	Impeller nut
923	Bearing nut
931	Lockwasher
940	Fitting key
950	Plug



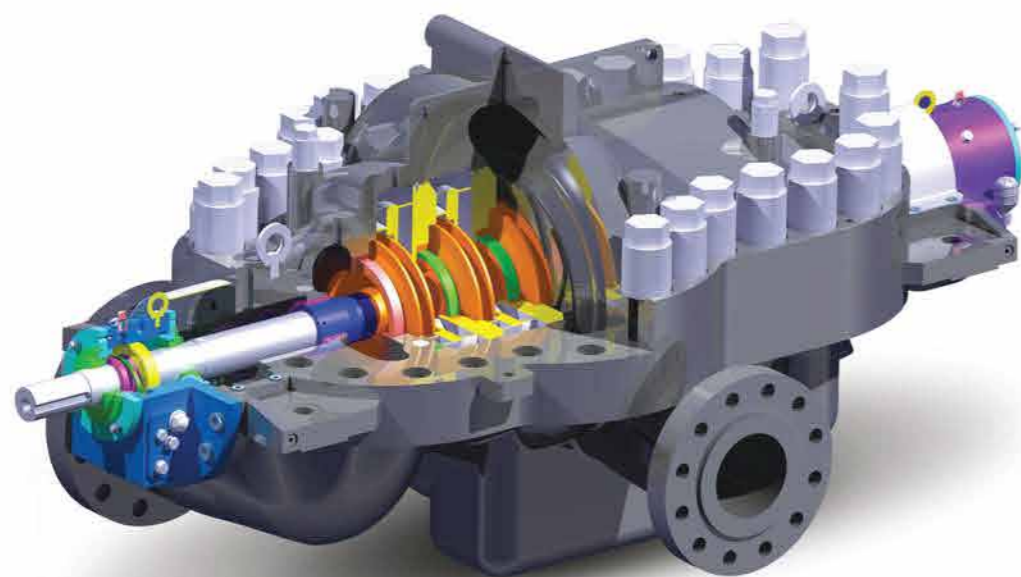
BS3 PUMPS

● **Family Diagram**



● **NOTE:**

For other ranges of BS3 pumps, design and manufacturing as per customer request is possible



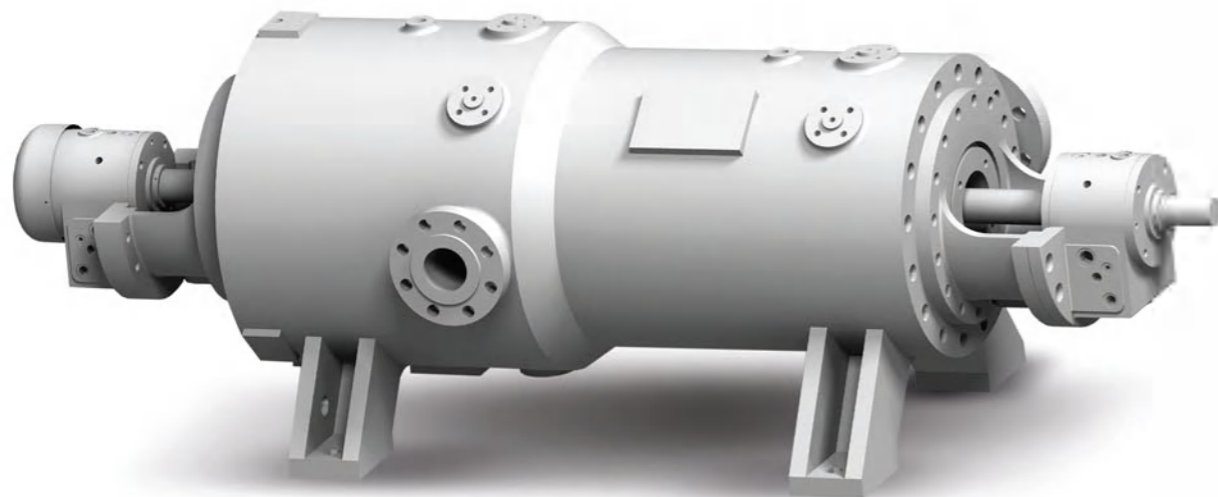
BT5 PUMPS



BT5 PUMPS

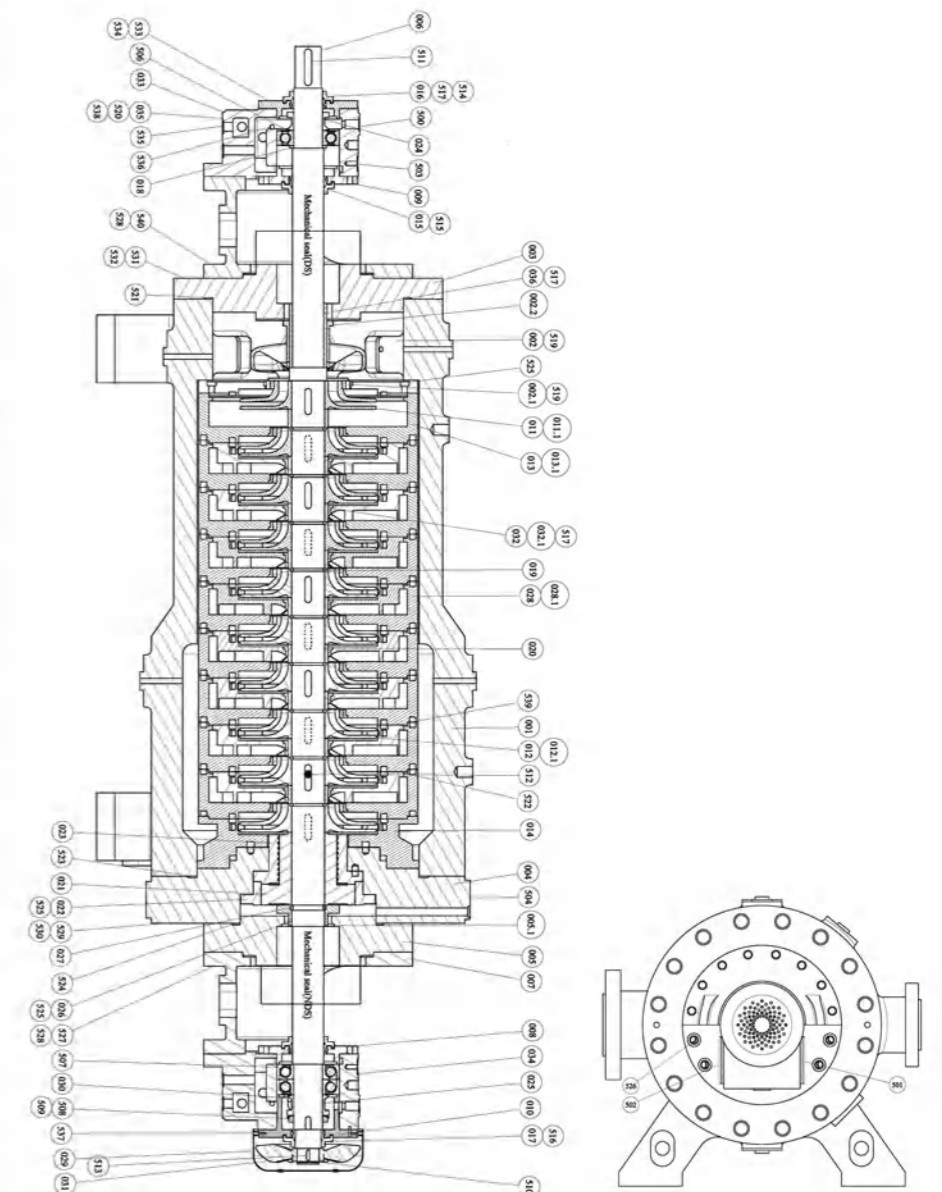
Description:

- Horizontal centrifugal barrel type pumps acc. to BB5 type as per API 610 standard (Latest Ed.)
- Multi stage , single suction impeller
- Double casing
- Radially split
- Between bearing
- Top – top or side- side or top- side nozzle arrangements



BT5 PUMPS SECTIONAL

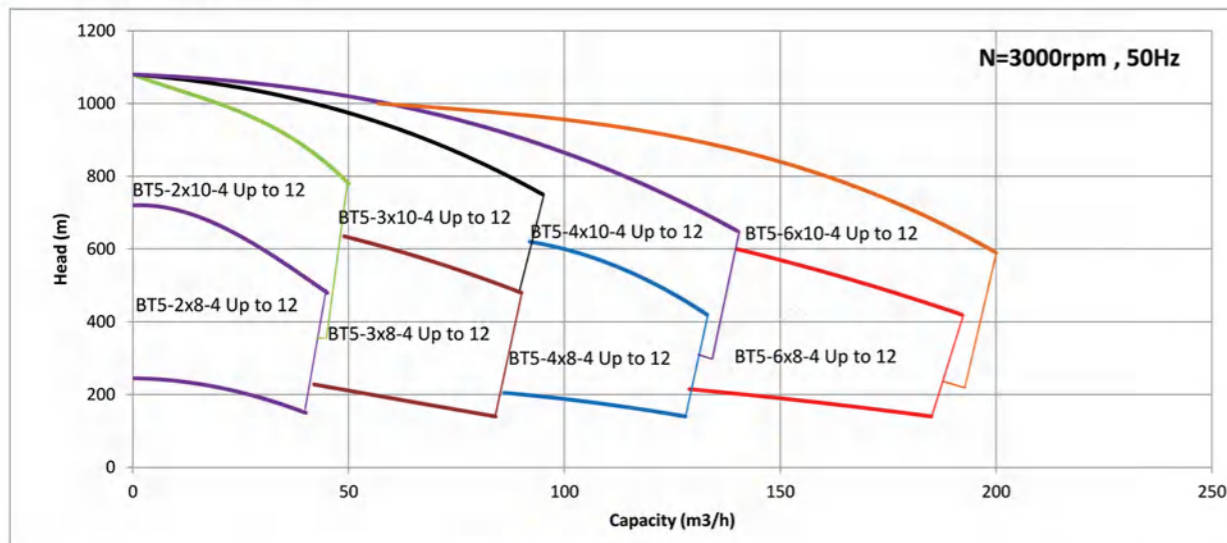
Item	Qty	Double End Stud	Std.No.	Note
001	1	Barrel	2300010	
002	1	Suction piece	2300020	
002.1	1	Suction piece wear Ring1	2300020	TC:2300021
002.2	1	Suction piece Wear Ring2	2300020	TC:2300022
003	1	suction delivery cover	2300030	
004	1	Discharge Delivery cover	2300040	
005	1	Discharge Stuffing Box	2300050	
005.1	1	Throttle Bush	2300050	TC:2300051
006	1	Main shaft	2300060	
007	2	Spacer	2300070	
008	2	Bearing cover PS	2300080	
009	1	Bearing cover DS	2300090	
010	2	Bearing cover NDS	2300100	
011	1	First Stage Impeller	2300110	
011.1	1	First Stage Impeller Wear Ring	2300110	TC:2300111
012	9	Impeller	2300120	
012.1	9	Impeller Wear Ring	2300120	TC2300121
013	1	First Stage Diffuser cover	2300130	
013.1	9	First Stage Diffuser cover Wear Ring	2300130	TC:2300131
014	1	Last Stage Diffuser	2300140	
015	2	Deflector PS	2300150	
016	1	Deflector DS	2300160	
017	1	Deflector NDS	2300170	
018	1	Bearing Spacer	2300180	
019	9	Split Ring	2300190	
020	9	Impeller Spacer	2300200	
021	1	Balance Sleeve	2300210	
022	1	Balance cover	2300220	
023	1	Balance Bush	2300230	
024	1	Flinger DS	2300240	
025	1	Flinger NDS	2300250	
026	1	Lock Bush	2300260	
027	1	Balance Split Ring	2300270	
028	8	Diffuser Cover	2300280	
028.1	8	Diffuser Cover Wear Ring	2300280	TC:2300281
029	1	Ventilator	2300290	
030	2	Oil Ring	2300300	
031	1	Ventilator Cap	2300310	
032	9	Diffuser	2300320	
032.1	9	Diffuser Wear Ring	2300320	TC:2300321
033	1	Bearing Housing(DS)	2300330	Model No:2033301
034	1	Bearing Housing(NDS)	2300340	Model No:2033302
035	2	Cooling Cover	2023503	
036	1	Suction sleeve	2300360	
500	2	Breather		G1/2"
501	2	Constant level oiler		G1/4"
502	2	Oil level sight glass		G3/4"
503	2	Eye bolt	DIN 580	M8
504	4	Eye bolt	DIN 580	M24
506	1	Deep Groove Ball Bearing	DIN 625	6311
507	2	Angular Contact Ball bearing	DIN 628	7311 BECBM
508	1	Bearing Nut	DIN 981	KM11
509	1	Bearing Lock Washer	DIN 934	MD 11
510	1	Circlip	DIN 471	φ42x2.5
511	1	Parallel Key	DIN 685	A 14x10x70
512	10	Parallel Key	DIN 685	A 12x8x45
513	1	Parallel Key	DIN 685	A 6x6x20
514	1	O-Ring	DIN 3770	φ55x2.5
515	2	O-Ring	DIN 3770	φ60x2.5
516	1	O-Ring	DIN 3770	φ50x2.5
517	42	Socket Set Screw Cone Point	ISO 4027	M5x6
518	3	Socket Set Screw Cone Point	ISO 4027	M5x10
519	60	Socket Set Screw Cone Point	ISO 4027	M6x10
520	2	Gasket	2023504	
521	1	Gasket		φ390x366x3.5
522	9	Gasket		φ378x366x3.5
523	1	Gasket		φ456x426x3.5
524	1	Gasket		φ286x261x3.5
525	36	Hex Socket Head Screw	ISO 4762	M10x30
526	8	Hex Socket Head Screw	ISO 4762	M20x40
527	16	Double End Stud	DIN 938	M20x110
528	32	Hex Nut	ISO 4032	M20
529	16	Double End Stud	DIN 938	M36x140
530	16	Hex Nut	ISO 4032	M36
531	16	Double End Stud	DIN 938	M27x80
532	16	Hex Nut	ISO 4032	M27
533	16	Double End Stud	DIN 938	M12x30
534	16	Hex Nut	ISO 4032	M12
535	12	Screw Plug	DIN 910	G1/2"
536	6	Screw Plug	DIN 910	G3/8"
537	4	Hex Head Bolt	ISO 4017	M4x25
538	12	Hex Head Bolt	ISO 4017	M8x20
539	42	Dowel Pin	ISO 8745	φ12x16
540	16	Double End Stud	DIN 938	M20x55



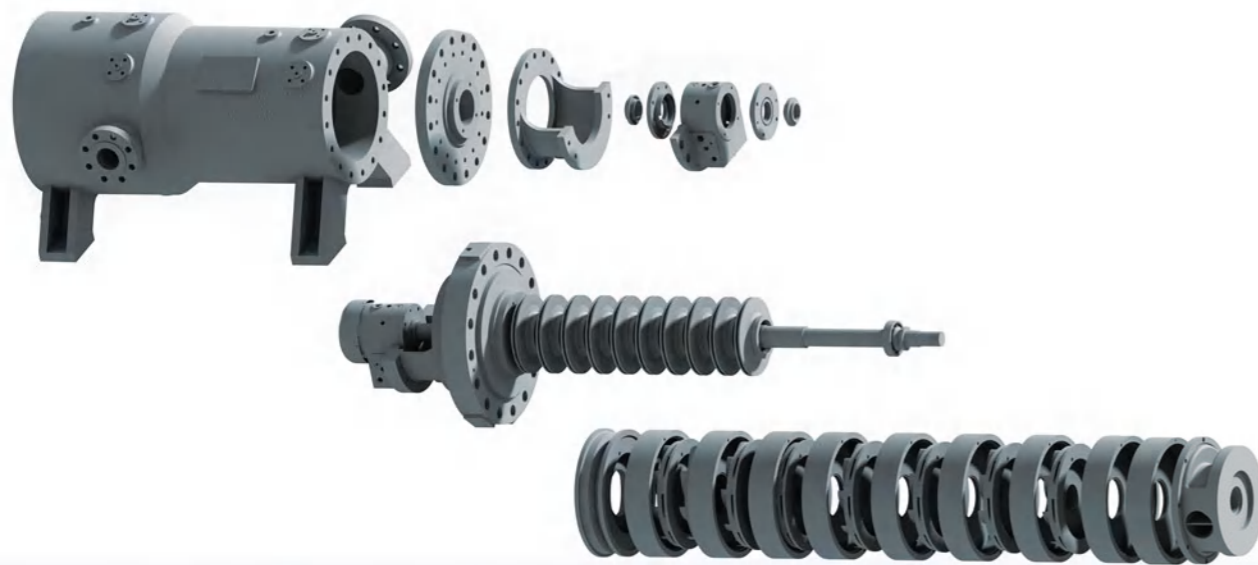
BT5 PUMPS

VLTP / CTP PUMPS

• Family Diagram



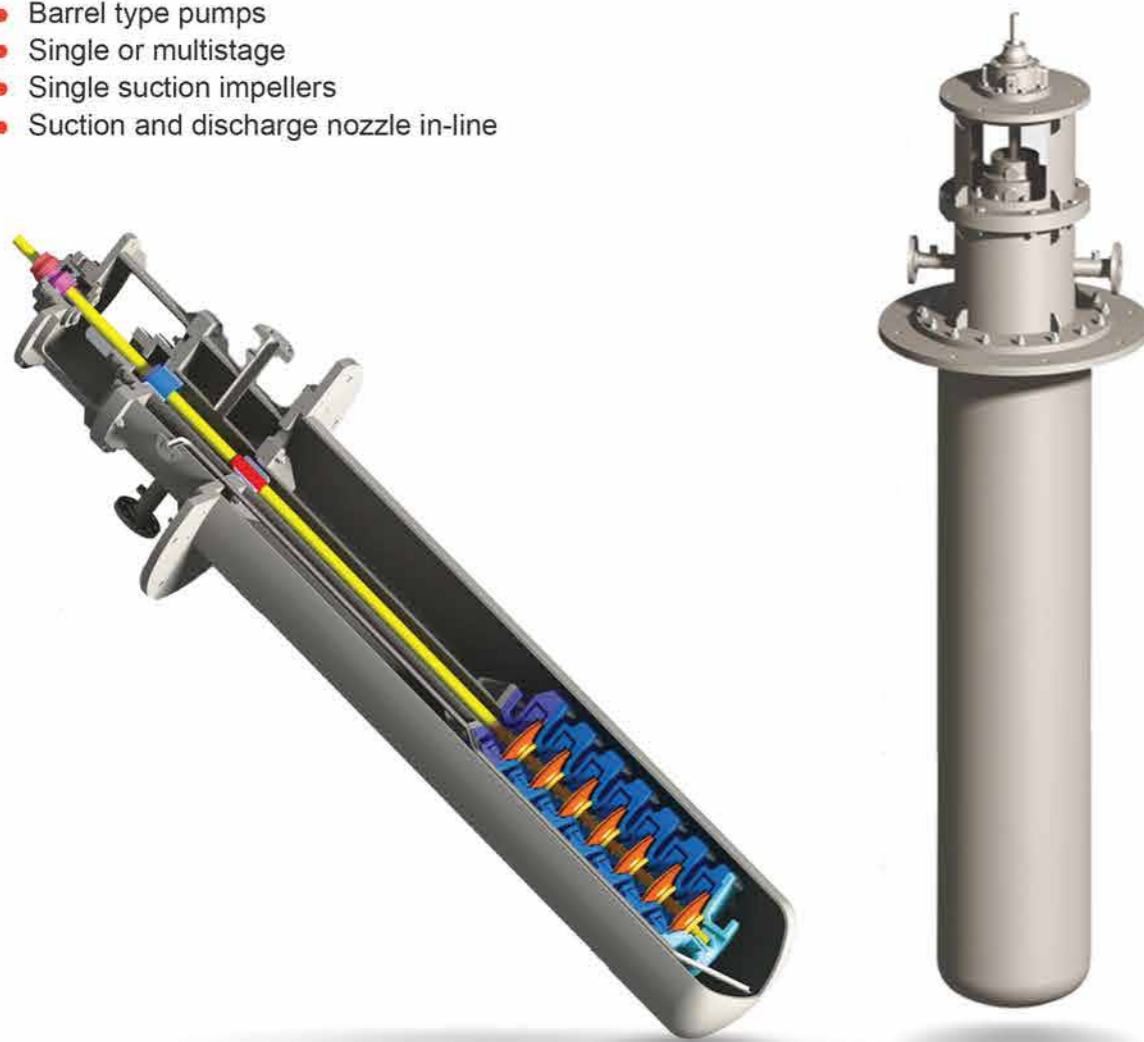
NOTE:
For other ranges of BT5 pumps, design and manufacturing as per customer request is possible



VLTP / CTP PUMPS

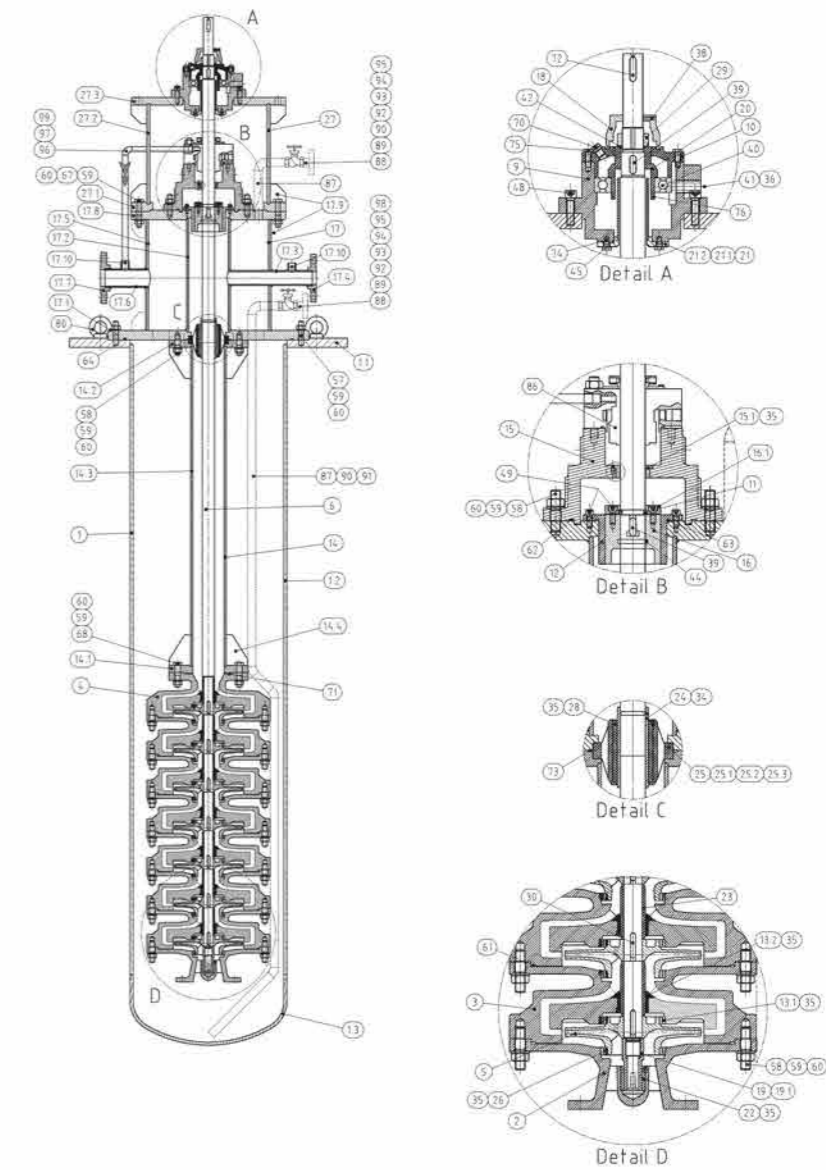
Acc. to VS6 type as per API 610 standard (Latest Ed.)

- Vertical arrangement
- Barrel type pumps
- Single or multistage
- Single suction impellers
- Suction and discharge nozzle in-line

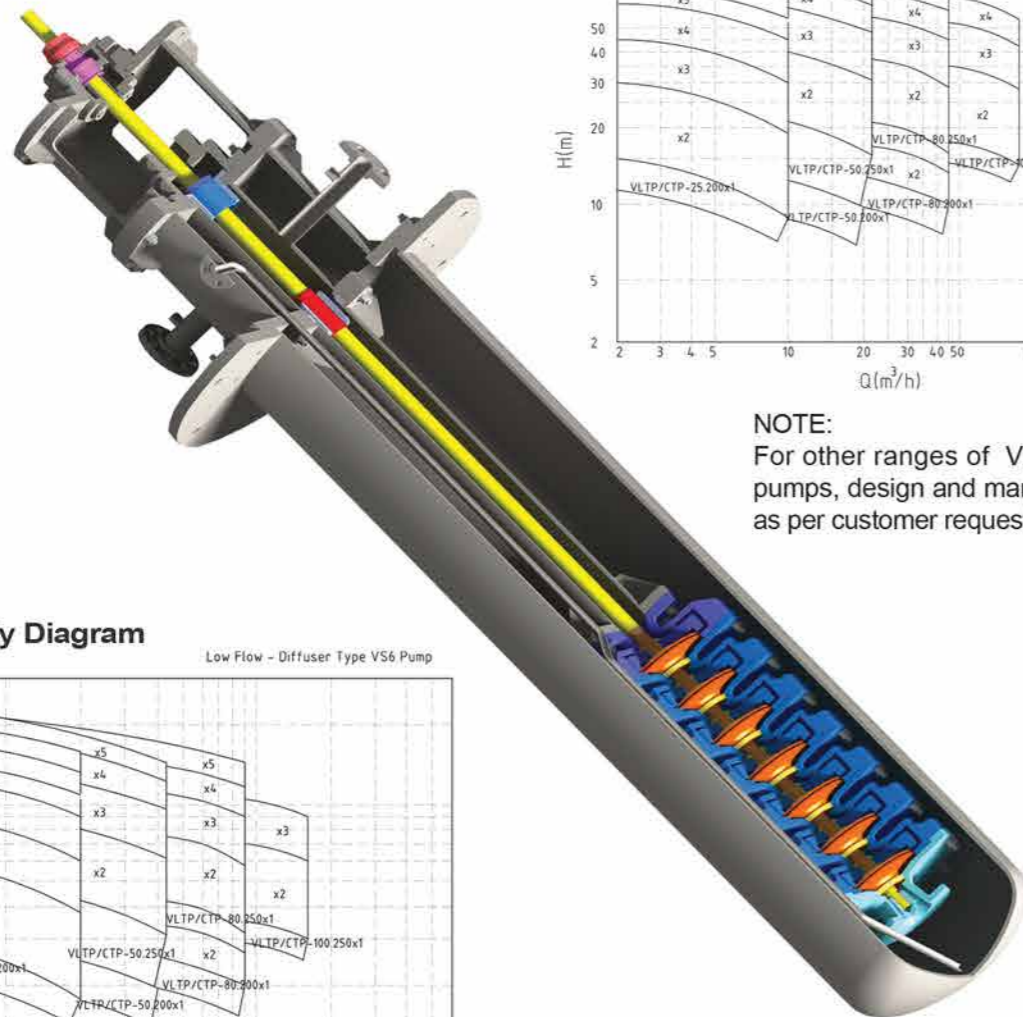


VLTP / CTP PUMPS SECTIONAL

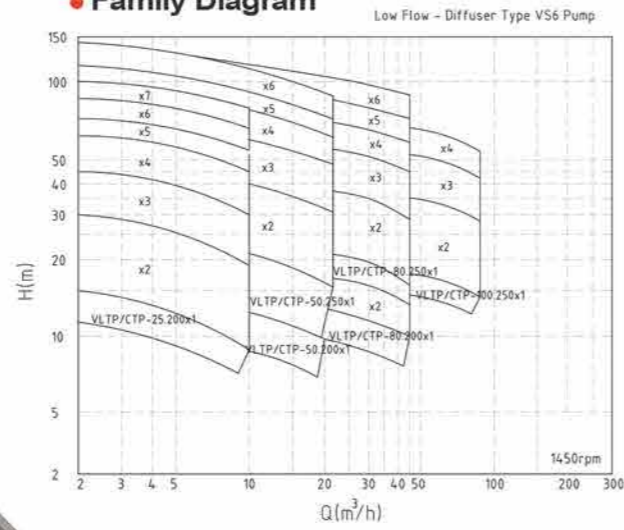
401	Welded Union	1/2"
402	Welded Union	3/4"
403	Pipe	50x40 1/2"
404	Welded elbow 90°	50x40 1/2"
405	Hex Nut	ISO 4032 M8
406	Subst End Stud	DN 908 M18x35
407	Castel	
408	Blind Flange	# 300 3/4"
409	Welder elbow 45°	SCM 40 3/4"
410	Welder elbow 90°	SCM 40 3/4"
411	Castel-welder Flange	# 300 3/4"
412	Gate Valve	# 300 3/4"
413	Pipe	SCM 40 3/4" a=3
414	Mechanical seal	
415	Eye Bolt	DN 140 M20
416	Internal Retaining Ring	DN 415 #10x2
417	Hex Head Bolt	ISO 4017 M8x25
418	Hex Head Bolt	ISO 4017 M8x16
419	Castel	#10x10x10
420	Grabbit Key	DN 685 10x10x10
421	Castel	#10x10x10
422	Pin	DN 910 10x10
423	Hex Head Bolt	ISO 4016 M16x30
424	Hex Head Bolt	ISO 4016 M16x80
425	Castel	#16x16x16
426	Castel	#16x16x16
427	Castel	#16x16x16
428	Castel	#16x16x16
429	Hex Nut	ISO 4032 M16
430	Washer	DN 917 16
431	Subst End Stud	DN 918 M16x50
432	Subst End Stud	DN 918 M16x80
433	Socket Lap Screw	ISO L160 M16x20
434	Socket Lap Screw	ISO L160 M16x25
435	C-Ring	DN 917 #10x13
436	C-Ring	DN 917 #10x15
437	Bearing Washer	M8
438	C-Ring	ISO 4017 M8
439	Deep groove ball bearing	DN 625 6216
440	Parallel Key	DN685 10x10x10
441	Socket Set Screw Flat Head	ISO 4026 M16x3
442	Socket Set Screw	ISO 4026 M16x3
443	Socket Set Screw	ISO 4027 M16x10
444	Socket Set Screw	ISO 4028 M16x15
445	Impeller Nut	DN 685 16x16x16
446	Bearing Nut	4460740
447	Roller Bearing	4460780
448	Impeller Flange	4460700
449	Pipe	4460700 N° SCM40
450	Impeller Flange	4460700
451	Impeller Flange	4460700
452	Impeller Flange	4460700
453	Impeller Flange	4460700
454	Impeller Flange	4460700
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464	Impeller Flange	4460700
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466	Impeller Flange	4460700
467	Impeller Flange	4460700
468	Impeller Flange	4460700
469	Impeller Flange	4460700
470	Impeller Flange	4460700
471	Impeller Flange	4460700
472	Impeller Flange	4460700
473	Impeller Flange	4460700
474	Impeller Flange	4460700
475	Impeller Flange	4460700
476	Impeller Flange	4460700
477	Impeller Flange	4460700
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496	Impeller Flange	4460700
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499	Impeller Flange	4460700
500	Impeller Flange	4460700



VLTP / CTP PUMPS

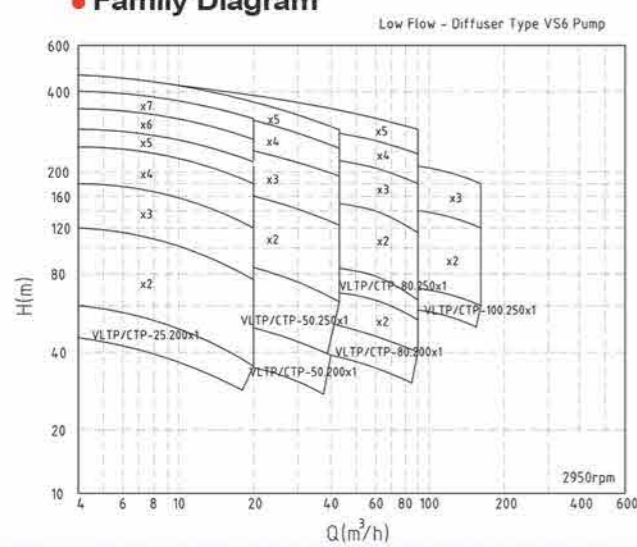


• Family Diagram



NOTE:
For other ranges of VLTP / CTP pumps, design and manufacturing as per customer request is possible

• Family Diagram



NOTE:
For other ranges of VLTP / CTP pumps, design and manufacturing as per customer request is possible

APPENDIX

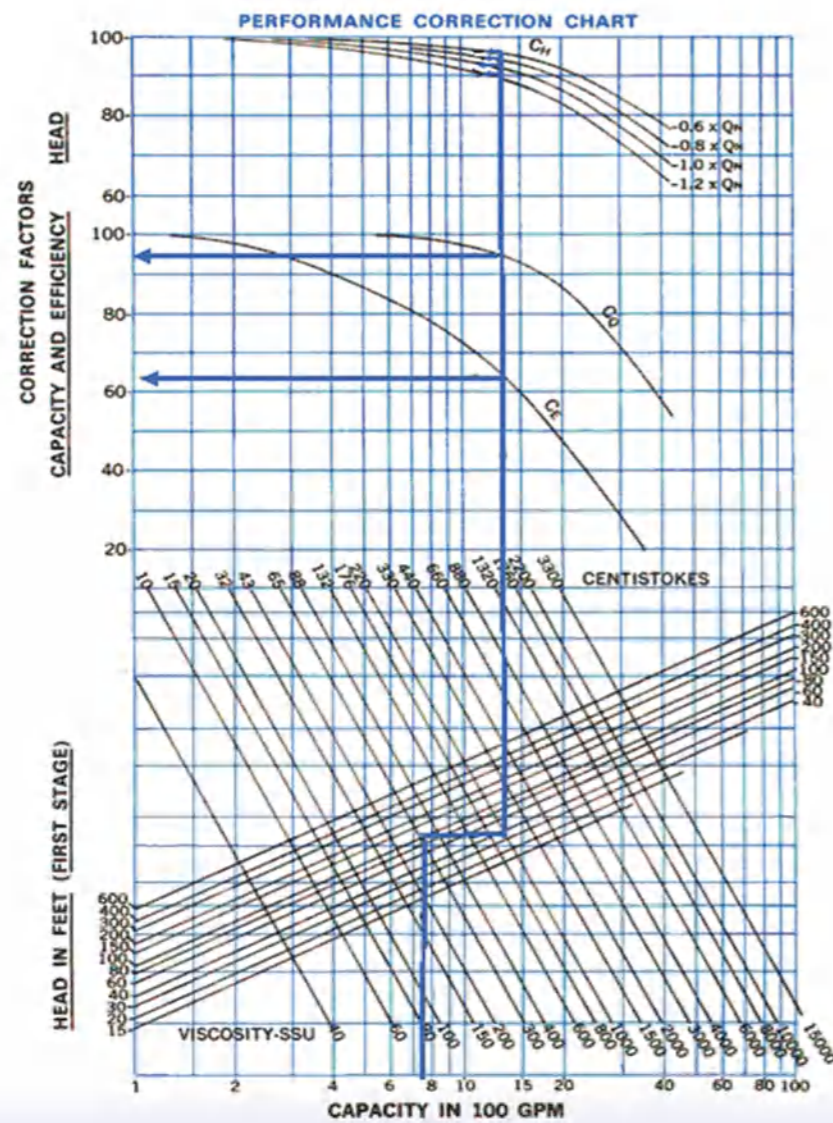
- Guide line pump selection for viscous fluids.
- Material class selection guidance.



• **Viscous Fluids**

The performance of centrifugal pumps is affected when pumping viscous liquids. A dramatic increase in Brake Horsepower and a reduction of Flow and Head occurs. To determine the affects of pumping viscous fluids using a centrifugal pump use the Performance Correction Chart below:

- CH = Head Correction
- CQ = Flow Correction.
- CE = Efficiency Correction.



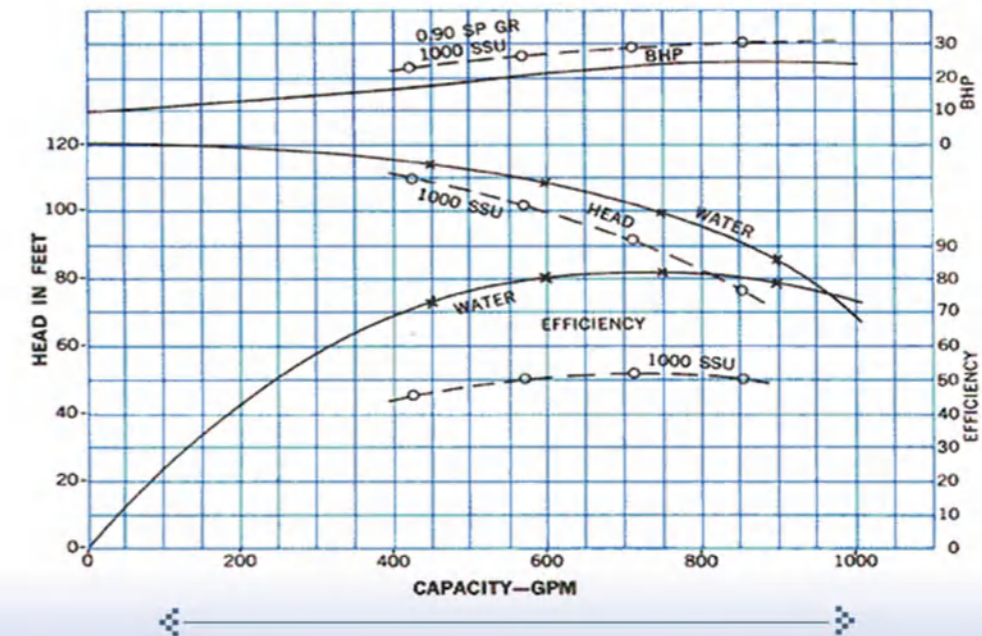
EXAMPLE

To determine the affects of pumping a 1,000 SSU viscous hydrocarbon liquid with a specific gravity of 0.9 using a pump with known water performance characteristics we find that:

CALCULATIONS				
WATER CAPACITY(GPM)	450	600	750	900
WATER HEAD (FT)	114	108	100	86
WATER EFFICIENCY	72.5%	80%	82%	79.5%
HORSEPOWER(BHPR)	16.1	18.4	20.8	22.1
SPECIFIC GRAVITY	.90	.90	.90	.90
VISCOSITY	1,000SSU	1,000SSU	1,000SSU	1,000SSU
C _Q (FLOW CORRECTION)	0.95	0.95	0.95	0.95
CH (HEAD CORRECTION)	0.96	0.94	0.92	0.89
C _E (EFFICIENCY CORRECTION)	0.635	0.635	0.635	0.635
VISCOUS CAPACITY(GPM)	427	570	712	855
VISCOUS HEAD(FT)	109.5	101.5	92	76.5
VISCOUS EFFICIENCY	46%	50.8%	52.1%	50.5%
VISCOUS HORSEPOWER	23.1	25.9	28.6	29.4

These calculations can be plotted on a performance curve as follows:

PERFORMANCE CURVE



API STANDARD 610/ISO 13709

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Materials class selection guidance

Table G.1 – Materials class selection guidance

Service	Temperature range		Pressure range	Materials class	Ref. note
	°C	(°F)			
Fresh water, condensate, cooling tower water	< 100	< 212	All	I-1 or I-2	
Boiling water and process water	< 120	< 250	All	I-1 or I-2	a
	120 to 175	250 to 350	All	S-5	a
	> 175	> 350	All	S-6, C-6	a
Boiler feed water Axially split Double-casing (barrel)	> 95	> 200	All	C-6	
	> 95	> 200	All	S-6	
Boiler circulator	> 95	> 200	All	C-6	
Foul water, reflux drum water, water draw, and hydrocarbons containing these waters, including reflux streams	< 175	< 350	All	S-3 or S-6	b
	> 175	> 350	All	C-6	
Propane, butane, liquefied petroleum gas, ammonia, ethylene, low temperature services (minimum metal temperature)	230	< 450	All	S-1	
	> -46	> -50	All	S-1(LCB)	h
	> -73	> -100	All	S-1(LC2)	h
	> -100	> -150	All	S-1(LC3)	h, i
	> -196	> -320	All	A-7 or A-8	h, i
Diesel oil; gasoline; naphtha; kerosene; gas oils; light, medium and heavy lubricating oils; fuel oil; residuum; crude oil; asphalt; synthetic crude bottoms	< 230	< 450	All	S-1	
	230 to 370	450 to 700	All	S-6	b, c
	> 370	> 700	All	C-6	b
Non-corrosive hydrocarbons, e.g. catalytic reformat, isomaxate, desulfurized oils	230 to 370	450 to 700	All	S-4	c
Xylene, toluene, acetone, benzene, furfural, MEK, cumene	< 230	< 450	All	S-1	
Sodium carbonate	< 175	< 350	All	I-1	
Caustic (sodium hydroxide), concentration <20 %	< 100	< 212	All	S-1	d
	> 100	> 200	All	—	e
Seawater	< 95	< 200	All	—	f
Sour water	< 260	< 470	All	D-1	
Produced water, formation water and brine	All	All	All	D-1 or D-2	f
Sulfur (liquid state)	All	All	All	S-1	
FCC slurry	< 370	< 700	All	C-6	
Potassium carbonate	< 175	< 350	All	C-6	
	< 370	< 700	All	A-8	

Table G.1 (Continued)	Temperature range		Pressure range	Materials class	Ref. note
	°C	(°F)			
MEA, DEA, TEA stock solutions	< 120	< 250	All	S-1	
DEA, TEA-lean solutions	< 120	< 250	All	S-1 or S-8	d, g
MEA-lean solution (CO ₂ only)	80 to 150	175 to 300	All	S-9	d
MEA-lean solution (CO ₂ and H ₂ S)	80 to 150	175 to 300	All	S-8	d, g
MEA-, DEA-, TEA-, rich solutions	< 80	175	All	S-1 or S-8	d
Sulfuric acid concentration > 85 % 85 % to < 1 %	< 38	< 100	All	S-1	b
	< 230	< 450	All	A-8	b
Hydrofluoric acid concentration > 96 %	< 38	< 100	All	S-9	b
<p>The materials for pump parts for each material class are given in Annex H.</p> <p>Specific materials recommendations should be obtained for services not clearly identified by the service descriptions listed in this table.</p> <p>Cast iron casings, where recommended for chemical services, are for non-hazardous locations only. Steel casings (5.12.1.6) should be used for pumps in services located near process plants or in any location where released vapour from a failure could create a hazardous situation or where pumps could be subjected to hydraulic shock, for example, in loading services.</p> <p>^a Oxygen content and buffering of water should be considered in material selection.</p> <p>^b The corrosiveness of foul waters, hydrocarbons over 230 °C (450 °F), acids, and acid sludges may vary widely. Material recommendations should be obtained for each service. The material class indicated above is satisfactory for many of these services, but shall be verified. S-8 materials may also be considered for operating temperatures below 95 °C (200 °F).</p> <p>^c If product corrosivity is low, Class S-4 materials may be used for services at 231 °C to 370 °C (451 °F to 700 °F). Specific material recommendations should be obtained in each instance.</p> <p>^d All welds shall be stress-relieved.</p> <p>^e UNS N08007 or Ni-Cu alloy pump material should be used.</p> <p>^f For seawater, produced water, formation water and brine services, the purchaser and the vendor should agree on the construction materials that best suit the intended use.</p> <p>^g The vendor shall consider the effects of differential material expansion between casing and rotor and confirm suitability if operating temperatures are to exceed 95 °C (200 °F).</p> <p>^h Materials selected for low temperature services shall meet the requirements of 5.12.4 and 5.12.1.6. Casting alloy ASTM A 352, Grades LCB, LC2 & LC3 is shown only for reference. Use equivalent materials for wrought alloys.</p> <p>ⁱ Material alloys based on aluminium, bronze, aluminium bronze and nickel, may also be considered for temperatures as low as -196 °C (-320 °F).</p>					

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Table H.1 – Material classes for pump parts

PART	Full compliance materials ^b	Material classes and abbreviations													
		I-1	I-2	S-1	S-3	S-4	S-5	S-6	S-8 ^l	S-9 ^l	C-6	A-7	A-8	D-1 ^j	D-2 ^j
		CI ^a	CI	STL	STL	STL	STL	STL	STL	STL	12 % CHR	AUS	316 AUS	Duplex	Super Duplex
		CI	BRZ	CI	NI-RESIST	STL	STL	12 % CHR	316 AUS	Ni-Cu Alloy	12 % CHR	AUS ^{c, d}	316 AUS ^d	Duplex	Super Duplex
Pressure casing	Yes	Cast iron	Cast iron	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	12 % CHR	AUS	316 AUS	Duplex	Super Duplex
Inner case parts: (bowls, diffusers, diaphragms)	No	Cast iron	Bronze	Cast iron	Ni-Resist	Cast iron	Carbon steel	12 % CHR	316 AUS	Ni-Cu Alloy	12 % CHR	AUS	316 AUS	Duplex	Super Duplex
Impeller	Yes	Cast iron	Bronze	Cast iron	Ni-Resist	Carbon steel	Carbon steel	12 % CHR	316 AUS	Ni-Cu Alloy	12 % CHR	AUS	316 AUS	Duplex	Super Duplex
Case wear rings ^k	No	Cast iron	Bronze	Cast iron	Ni-Resist	Cast iron	12 % CHR Hardened	12 % CHR Hardened	Hard-faced 316AUS ^e	Ni-Cu Alloy	12 % CHR Hardened	Hard-faced AUS ^e	Hard-faced 316 AUS ^e	Hard-faced Duplex ^e	Hard-faced Super Duplex ^e
Impeller wear rings ^k	No	Cast iron	Bronze	Cast iron	Ni-Resist	Cast iron	12 % CHR Hardened	12 % CHR Hardened	Hard-faced 316AUS ^e	Ni-Cu Alloy	12 % CHR Hardened	Hard-faced AUS ^e	Hard-faced 316 AUS ^e	Hard-faced Duplex ^e	Hard-faced Super Duplex ^e
Shaft ^d	Yes	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	AISI 4140	AISI 4140 ^f	316 AUS	Ni-Cu Alloy	12 % CHR	AUS	316 AUS	Duplex	Super Duplex
Throat bushings ^k	No	Cast iron	Bronze	Cast iron	Ni-Resist	Cast iron	12 % CHR Hardened	12 % CHR Hardened	316 AUS	Ni-Cu Alloy	12 % CHR Hardened	AUS	316 AUS	Duplex	Super Duplex
Interstage sleeves ^k	No	Cast iron	Bronze	Cast iron	Ni-Resist	Cast iron	12 % CHR Hardened	12 % CHR Hardened	Hard-faced 316AUS ^e	Ni-Cu Alloy	12 % CHR Hardened	Hard-faced AUS ^e	Hard-faced 316 AUS ^e	Hard-faced Duplex ^e	Hard-faced Super Duplex ^e
Interstage bushings ^k	No	Cast iron	Bronze	Cast iron	Ni-Resist	Cast iron	12 % CHR Hardened	12 % CHR Hardened	Hard-faced 316AUS ^e	Ni-Cu Alloy	12 % CHR Hardened	Hard-faced AUS ^e	Hard-faced 316 AUS ^e	Hard-faced Duplex ^e	Hard-faced Super Duplex ^e
Case and gland studs	Yes	Carbon steel	Carbon steel	AISI 4140 steel	AISI 4140 Steel	AISI 4140 Steel	AISI 4140 Steel	AISI 4140 Steel	AISI 4140 Steel	Ni-Cu Alloy Hardened ^l	AISI 4140 Steel	AISI 4140 Steel	AISI 4140 Steel	Duplex ⁱ	Super Duplex ⁱ
Case gasket	No	AUS, Spiral wound ^g	AUS, Spiral wound ^g	AUS, Spiral wound ^g	AUS, Spiral wound ^g	AUS, Spiral wound ^g	AUS, Spiral wound ^g	AUS, Spiral wound ^g	316 AUS Spiral wound ^g	Ni-Cu Alloy, Spiral wound, PTFE filled ^g	AUS, Spiral wound ^g	AUS, Spiral wound ^g	316 AUS Spiral wound ^g	Duplex SS Spiral wound ^g	Duplex SS Spiral wound ^g

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Table H.1 (Continued)

PART	Full compliance materials ^b	Material classes and abbreviations													
		I-1	I-2	S-1	S-3	S-4	S-5	S-6	S-8 ^l	S-9 ^l	C-6	A-7	A-8	D-1 ^j	D-2 ^j
		CI ^a	CI	STL	STL	STL	STL	STL	STL	STL	12 % CHR	AUS	316 AUS	Duplex	Super Duplex
		CI	BRZ	CI	NI-RESIST	STL	STL	12 % CHR	316 AUS	Ni-Cu Alloy	12 % CHR	AUS ^{c, d}	316 AUS ^d	Duplex	Super Duplex
Discharge head/ suction can	Yes	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	AUS	AUS	316 AUS	Duplex	Super Duplex
Column / bowl shaft bushings	No	Nitrile butadiene ^h	Bronze	Filled carbon	Nitrile butadiene ^h	Filled carbon	Filled carbon	Filled carbon	Filled carbon	Filled carbon	Filled carbon	Filled carbon	Filled carbon	Filled carbon	Filled carbon
Wetted fasteners (bolts)	Yes	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	316 AUS	316 AUS	316 AUS	Ni-Cu Alloy	316 AUS	316 AUS	316 AUS	Duplex	Super Duplex

^a The abbreviations in the upper part of the second row indicate the case material; the abbreviations in the lower part of the second row indicate trim material. Abbreviations are as follows: BRZ = bronze, STL = steel, 12 % CHR = 12 % chromium, AUS = austenitic stainless steel, CI = cast iron, 316 AUS = Type 316 austenitic stainless steel

^b See 5.12.1.4

^c Austenitic stainless steels include ISO Types 683-13-10/19 (AISI Standard Types 302, 303, 304, 316, 321, and 347).

^d For vertically suspended pumps with shafts exposed to liquid and running in bushings, the standard shaft material is 12 % chrome, except for Classes S-9, A7, A-8, and D-1. The standard shaft material for cantilever pumps (Type VS5) is AISI 4140 where the service liquid allows (see Annex G, Table G.1).

^e Unless otherwise specified, the need for hard-facing and the specific hard-facing material for each application is determined by the vendor and described in the proposal. Alternatives to hard-facing may include opening running clearances (5.7.4) or the use of non-galling materials or non-metallic materials, depending on the corrosiveness of the pumped liquid.

^f For Class S-6, the standard shaft material for boiler feed service and for liquid temperatures above 175 °C (350 °F) is 12 % chrome (see Annex G, Table G.1).

^g If pumps with axially split casings are furnished, a sheet gasket suitable for the service is acceptable. Spiral-wound gaskets should contain a filler material suitable for the service. Gaskets other than spiral wound, may be proposed and furnished if proven suitable for service and specifically approved by the purchaser.

^h Alternative materials may be substituted for liquid temperatures greater than 45 °C (110 °F) or for other special services.

ⁱ Unless otherwise specified, AISI 4140 steel may be used for non-wetted case and gland studs.

^j Some applications may require alloy grades higher than the Duplex materials given in Table H.2.

^k "Super Duplex" material grades with pitting resistance equivalency (PRE) values greater than 40 may be necessary.

PRE > 40, where PRE is based on actual chemical analysis.

PRE = %Cr_{free} + (3.3 × % molybdenum) + (2 × % copper) + (2 × % tungsten) + (16 × % nitrogen)

= [(% chromium - (14.5 × % carbon)) + (3.3 × % molybdenum) + (2 × % copper) + (2 × % tungsten) + (16 × % nitrogen)]

Note that alternative materials such as "super austenitic" may also be considered.

^l Non-metallic wear part materials, proven to be compatible with the specified process fluid, may be proposed within the applicable limits shown in Table H.4. Also see 5.7.4 c).

^m The vendor shall consider the effects of differential material expansion between casing and rotor and confirm suitability if operating temperatures are to exceed 95 °C (200 °F).



info@pumpturbine.ir | sale@pumpturbine.ir

www.pumpturbine.ir



