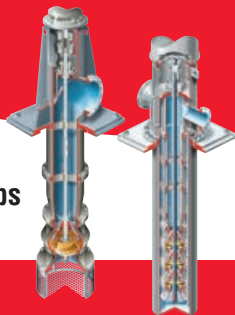


# VTP & VPC

## Vertical Turbine

### Wet-Pit and Double Casing Pumps

## MAINTENANCE CHECKLIST



# ⚠ DANGER

Read User Instructions **before** installing, operating or maintaining this pump.  
Copies available from Flowserve pump representative.

### Operating Limits

Pumped Liquid Temperature Limits*	5°C (40°F) to +80°C (176°F)
Maximum Ambient Temperature*	Up to +40°C (104°F)
Maximum Pump Speed	Refer to the Nameplate

\* Subject to written agreement from Flowserve. Special designs and materials may be available for pumps operating above and below these specified limits. Contact Flowserve for upgrade options available for your specific application.

### Impeller Clearance Settings

Flowserve recommends the following impeller settings based on the pump sizes.

If the Pump Size Is:	Setting for Enclosed Impellers	Setting for Semi-Open Impellers
Size 6 thru size 12	3~4 mm (0.13~0.15 in)	0.25 mm to 0.38 mm (0.010 in to 0.015 in)
Size 14 and above	6~7 mm (0.25~0.27 in)	0.63 mm to 0.76 mm (0.025 in to 0.030 in)

Note: Shafts elongate due to the hydraulic thrust of the pump and the impellers must be compensated for this elongation. Shaft elongation varies for each model depending upon the size, shaft length, shaft diameter, impeller weight, number of stages. Please see the documentation supplied along with the pump for exact impeller setting value matched for the specific pump that you have purchased.

### Shaft / Bearing Clearance

Shaft Size mm (in)	Shaft Diameter/Tolerance (Min Dia - Max Dia) mm (in)		Bearing Clearance (Max/Min) mm (in)
	Min Dia	Max Dia	
25.40 (1.000)	25.35 (0.998)	25.40 (1.000)	0.28/0.13 (0.011/0.005)
31.75 (1.250)	31.70 (1.248)	31.75 (1.250)	0.35/0.15 (0.012/0.006)
38.10 (1.500)	38.05 (1.498)	38.10 (1.500)	0.33/0.18 (0.013/0.007)
42.86 (1.690)	42.81 (1.685)	42.86 (1.687)	0.36/0.18 (0.014/0.007)
49.21 (1.940)	49.16 (1.935)	49.21 (1.937)	0.38/0.23 (0.015/0.008)
55.56 (2.190)	55.51 (2.185)	55.56 (2.187)	0.41/0.23 (0.016/0.009)
61.91 (2.440)	61.86 (2.435)	61.91 (2.437)	0.41/0.23 (0.016/0.009)
68.26 (2.690)	68.21 (2.685)	68.26 (2.687)	0.43/0.23 (0.017/0.009)
74.61 (2.940)	74.56 (2.935)	74.61 (2.937)	0.43/0.23 (0.017/0.009)
82.55 (3.250)	82.47 (3.247)	82.55 (3.250)	0.46/0.25 (0.018/0.010)
88.90 (3.500)	88.82 (3.497)	88.90 (3.500)	0.48/0.28 (0.019/0.011)
95.25 (3.750)	95.17 (3.747)	95.25 (3.750)	0.53/0.35 (0.021/0.012)
101.60 (4.000)	101.58 (3.997)	101.60 (4.000)	0.56/0.33 (0.022/0.013)
114.30 (4.500)	114.22 (4.497)	114.30 (4.500)	0.58/0.35 (0.023/0.014)
127.00 (5.000)	126.92 (4.997)	127.00 (5.000)	0.61/0.38 (0.024/0.015)

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## Bolt Torque Values for Class 2 Lubricated Threads

Thread Data		Material Group					
		A 316 SS	B ASTM B164 UNS N04400	C Hastelloy C276	D ASTM A449 Grade 5	E ASTM A193 Grade B7M	F ASTM A193 Grade B7
		Approximate Yield Stress – N/mm <sup>2</sup> (psi)					
Nominal Diameter	Threads per 25 mm/1 in	207 (30000)	276 (40000)	345 (50000)	441 (60000)	552 (80000)	690 (100000)
mm (in)		Torque Nm (lb-ft)					
6 (0.25)	20	4 (3)	5 (4)	5 (4)	7 (5)	9 (7)	12 (9)
8 (0.31)	18	7 (5)	8 (6)	11 (8)	14 (10)	17 (13)	21 (16)
10 (0.37)	16	9 (7)	14 (10)	16 (12)	20 (15)	27 (20)	34 (25)
11 (0.43)	14	16 (12)	20 (15)	25 (19)	31 (23)	42 (31)	53 (39)
12 (0.50)	13	23 (17)	31 (23)	39 (29)	47 (35)	62 (46)	78 (58)
15 (0.56)	12	27 (20)	45 (33)	75 (41)	66 (49)	89 (66)	111 (82)
16 (0.62)	11	41 (30)	60 (44)	54 (73)	88 (65)	118 (87)	149 (110)
19 (0.74)	10	81 (60)	101 (75)	127 (94)	149 (110)	203 (150)	257 (190)
22 (0.87)	9	122 (90)	163 (120)	203 (150)	258 (190)	312 (250)	420 (310)
25 (1.00)	8	190 (140)	244 (180)	312 (230)	366 (270)	488 (360)	610 (450)
29 (1.13)	7	271 (200)	352 (260)	448 (330)	529 (390)	705 (520)	882 (650)
29 (1.13)	7	271 (200)	366 (270)	461 (340)	556 (410)	732 (540)	923 (680)
32 (1.25)	7	366 (270)	488 (360)	610 (450)	746 (550)	990 (730)	1235 (910)
32 (1.25)	8	379 (280)	502 (370)	637 (470)	760 (560)	1017 (750)	1275 (940)
35 (1.38)	6	434 (320)	570 (420)	719 (530)	855 (630)	1140 (840)	1425 (1050)
35 (1.38)	8	461 (340)	610 (450)	760 (560)	922 (680)	1221 (900)	1533 (1130)
38 (1.50)	6	556 (410)	746 (550)	936 (690)	1126 (830)	1506 (1110)	1872 (1380)
38 (1.50)	8	597 (440)	800 (590)	990 (730)	1194 (880)	1587 (1170)	1995 (1470)
41 (1.63)	5.5	719 (530)	963 (710)	1207 (890)	1438 (1060)	1927 (1420)	2402 (1770)
41 (1.63)	8	773 (570)	1031 (760)	1302 (960)	1560 (1150)	2076 (1530)	2592 (1910)
44 (1.75)	5	882 (650)	1180 (870)	1479 (1090)	1778 (1310)	2375 (1750)	2958 (2180)
44 (1.75)	8	971 (720)	1302 (960)	1628 (1200)	1940 (1430)	2592 (1910)	
50 (2.00)	4.5	1356 (1000)	1778 (1310)	2225 (1640)	2673 (1970)		
50 (2.00)	8	1478 (1090)	1968 (1450)	2470(1820)	2958 (2180)		
57 (2.25)	8	2143 (1580)	2850 (2100)				
63 (2.50)	8	2970 (2190)					

### Leveling:

The pump discharge head and mounting surface shall be leveled within 0.05 mm / 0.31 m (0.002 in/ft). The level shall not exceed 0.125 mm (0.005 in) elevation difference between any two points.

### Enclosed Lineshaft – Oil Lubricated

#### Non-Food Grade Lubricant Oils

Oil Manufacturer	Trade Name of the Oil
Conoco Inc.	Conoco Diamond Class Turbine Oil (ISO 32)
Exxon Company	Teresstic GT 32
Mobil Oil Company	Mobile DTE-797 (Grade-32)
Shell Oil Company	Tellus-32, Tellus-37 or Turbo Oil T-32
Chevron Lubricants	Chevron Turbine Oil TR-32
BP	Energol HL-C 32
Texaco, Inc.	Texaco Regal R&O 32

Notes:

Viscosity = 30-37 cSt

Amount = 3 drops per minute per 30 m (100 ft) of column length, but never fewer than 5 drops per minute total.

Prelubrication = Allow full tank of oil (1 gallon) to drain into pump prior to startup.

#### Food Grade Lubricant Oils

Oil Manufacturer	Trade Name of the Oil
Exxon Company	Exxon-DTE-FM32
Mobil Oil Company	Mobile DTE-FM-Grade-32
Shell Oil Company	Cassida HF 32

### Pump / Motor Coupling Fastener Torques

Coupling Size #	Flange Diameter mm (in)	Nm (lb ft)
1 & 2	111 or 137 (4.4 or 5.4)	122 (90)
3-5	156, 187, 213 (6.0, 7.4, 8.4)	237 (175)
6	250 (10.0)	424 (313)

Torque values are for standard fasteners lubricated with a high stress lubricant (such as graphite and oil, molydisulphite, white lead, etc.). For stainless steel bolts, multiply listed torques by 0.80.

### Alignment:

Total indicated runout (TIR) should not exceed 0.10 mm (0.004 in) for WA and WSA couplings or 0.05 mm (0.002 in) for PA and PSA couplings.

### Enclosed Lineshaft – Fresh Water Injection

Notes:

Amount = 0.45-0.90 m<sup>3</sup>/h (2-4 gpm) at 0.7-1.4 bar (10-20 psi) over the maximum discharge pressure\*

Type = Clean city water

Prelubrication = 10-20 minutes prior to pump start-up

\* In certain cases, only 0.7-1.4 bar (10-20 psi) of total pressure is required. Contact factory for review.