

# WHAT PUMP IS THAT? API 610 PUMPS



**\* OH1**  
OVERHUNG // HORIZONTAL // FLEXIBLY COUPLED // FOOT MOUNTED

- Horizontal, single stage
- Basic ISO / DIN / ANSI Pump
- Typically 16 bar rating
- Normally grease lube bearings
- Foot mounted
- Not centerline supported
- Not ideal for high temperatures

\* Not fully compliant with API 610



**OH2 UNITED ATC // UNITED ATC-1**  
(GENERAL API 610 PUMPING. THE MOST COMMON PUMP TYPE.)

OVERHUNG // HORIZONTAL // FLEXIBLY COUPLED // CENTRELINE MOUNTED

- Horizontal, single stage
- Centerline mounted
- Top or End Suction
- Oil Lube
- 40 bar MAWP minimum
- Confined gaskets
- Back Pull out Assembly
- One Seal Chamber
- Single Bearing Frame

STANDARD CONSTRUCTION:

- Temperatures to 200°C – uncooled
- Temperatures to 430°C – with cooling
- Pressures to 41 barg as standard – Higher Pressure Ratings Optional



**OH3 UNITED HVP**

OVERHUNG // VERTICAL // FLEXIBLY COUPLED // INTEGRAL BEARING FRAME

- Vertical, single stage In-Line
- Separate bearing frame (OH3)
- Used for High Suction Pressure applications
- Simple Installation, no grouting, no alignment
- 40 bar MAWP minimum
- Confined gaskets

STANDARD CONSTRUCTION:

- Temperatures to 100°C – uncooled
- Temperatures to 340°C – with cooling
- Pressures to 41 barg as standard – Higher Pressure Ratings Optional



**OH4 UNITED VP // DSVF**

OVERHUNG // VERTICAL // RIGIDLY COUPLED

- Vertical, single stage In-Line
- Shaft location by Driver (OH4)
- Rigid Coupling with or without spacer
- Simple Installation, no grouting, no alignment
- 40 bar MAWP minimum
- Confined gaskets

STANDARD CONSTRUCTION:

- Temperatures to 100°C – uncooled
- Temperatures to 340°C – with cooling
- Pressures to 41 barg as standard – Higher Pressure Ratings Optional



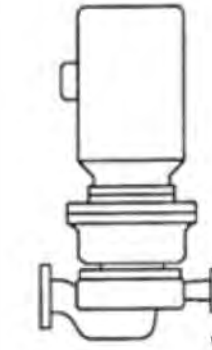
**OH5 UNITED VPC // DSVPC**

OVERHUNG // VERTICAL // CLOSE COUPLED

- Vertical, single stage In-Line
- Shaft location by Driver (OH5)
- Extended driver shaft
- Simple Installation, no grouting, no alignment
- 40 bar MAWP minimum
- Confined gaskets

STANDARD CONSTRUCTION:

- Temperatures to 100°C – uncooled
- Temperatures to 200°C – with cooling
- Pressures to 41 barg as standard – Higher Pressure Ratings Optional



**OH6**

OVERHUNG // VERTICAL // CLOSE COUPLED // GEARBOX DRIVEN HIGH SPEED

- Vertical, single stage
- High Speed
- Shaft location by Gearbox
- Extended gearbox shaft
- 40 bar MAWP minimum
- Confined gaskets

## METRIC CONVERSION FACTORS

U.S.G.P.M. x 0.2728 = m <sup>3</sup> /h	kg/cm <sup>2</sup> x 98.07 = kPa	Lb. in <sup>2</sup> / 3418 = kg. m <sup>2</sup>	ft <sup>3</sup> /s x 0.3048 = m <sup>3</sup> /s
U.S.G.P.M. x 0.2272 = m <sup>3</sup> /h	h.p. x 0.7457 = kW	ft <sup>3</sup> /min x 0.000472 = m <sup>3</sup> /s	gallon(imp) x 4.546 = L
P.S.I. x 6.895 = kPa	ft <sup>2</sup> x 0.02832 = m <sup>2</sup>	ft <sup>2</sup> x 0.0929 = m <sup>2</sup>	gallon(us) x 3.788 = L

## PUMPING FORMULAE

$$\text{Suction specific speed } N_{ss} = \frac{N \sqrt{Q}}{\text{NPSHR}^{0.75}}$$

$$\text{Torque (N.m)} = \frac{\text{kW Power} \times 9549}{\text{RPM}}$$

$$\text{PUMP POWER (kW)} = \frac{(\text{m}^3/\text{h}) \times (\text{metreshead}) \times 9.8 \times \text{SG}}{3600 \times \eta}$$

Where  $\eta$  is the pump efficiency expressed as a decimal, eg. 50% = 0.5

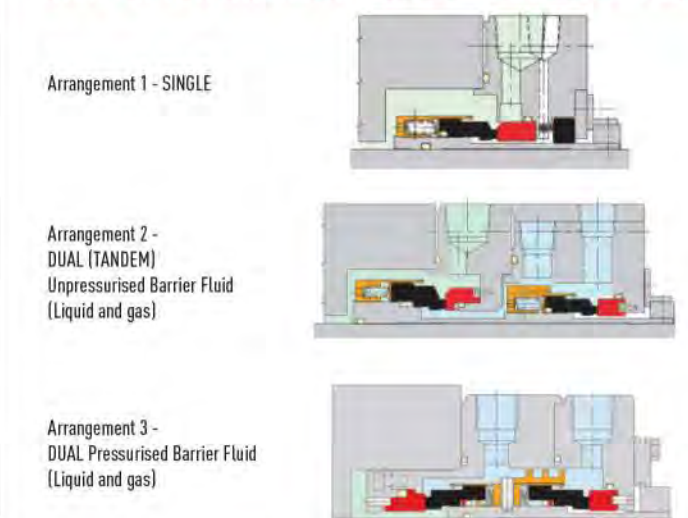
$$\text{REQUIRED MOTOR AMPS} = \frac{\text{kW} \times 1000}{\sqrt{3} \times \text{Volts} \times (\text{PowerFactor}) \times (\text{MotorEfficiency})}$$

For a 3 phase motor. Power Factor and Motor Efficiency to be expressed as decimals

$$\text{MOTOR SHAFT KW OUTPUT} = \frac{\sqrt{3} \times \text{Amps} \times \text{Volts} \times (\text{PowerFactor}) \times (\text{MotorEfficiency})}{1000}$$

## MECHANICAL SEAL TYPES

### SIMPLIFIED SUMMARY ONLY – REFER API 682

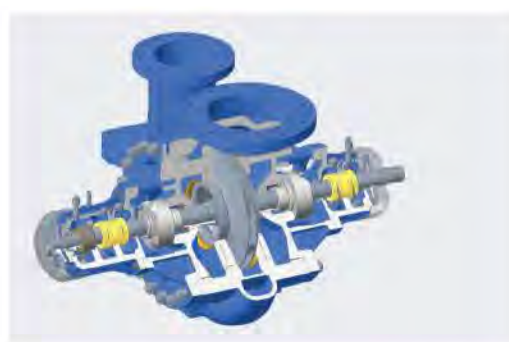


**BB1 UNITED DVS // UNIFLO**

BETWEEN BEARINGS // HORIZONTAL // AXIALLY SPLIT // CENTRELINE MOUNTED

- Horizontal, single stage
- Axially Split
- Axially Balanced
- Double Suction Impeller
- Centerline mounted (DVS)
- Oil Lube
- 40 – \*150 bar MAWP (DVS)
- Complete element balanced as an assembly

\* Customer approval required [6.3.9]  
• > 100bar • >200°C • SG < 0.7



**BB2 Single Stage UNITED DVSHF**

BETWEEN BEARINGS // HORIZONTAL // RADIALLY SPLIT // CENTRELINE MOUNTED

- Horizontal, single stage
- Radially Split
- Axially balanced
- Double Suction Impeller
- Centerline mounted Oil Lube
- 40 bar MAWP minimum
- Confined Gaskets
- Complete element balanced as an assembly
- Also available with Side –Side Nozzles

STANDARD CONSTRUCTION:

- Temperatures to 200°C – uncooled
- Temperatures to 430°C – with cooling
- Pressures to 41 barg as standard – Higher Pressure Ratings Optional



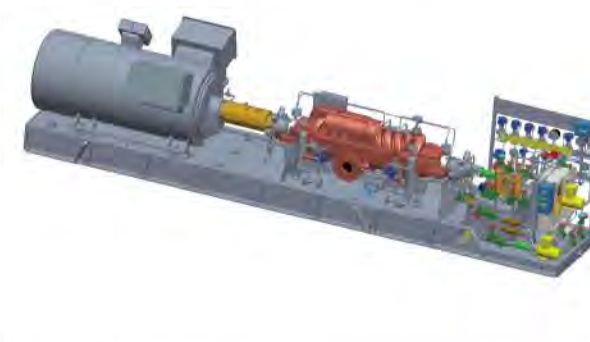
**BB2 Two Stage UNITED THF // DSTHF**

BETWEEN BEARINGS // HORIZONTAL // RADIALLY SPLIT // CENTRELINE MOUNTED

- Horizontal, two stage
- Radially Split
- Axially balanced
- Double Suction Impeller (DSTHF)
- Centerline mounted Oil Lube
- 40 bar MAWP minimum
- Confined Gaskets
- Available with Top – Top or Side – Side Nozzles

STANDARD CONSTRUCTION:

- Temperatures to 200°C – uncooled
- Temperatures to 430°C – with cooling
- Pressures to 41 barg as standard – Higher Pressure Ratings Optional



**BB3 Multi-Stage UNITED MSN // BF**

BETWEEN BEARINGS // HORIZONTAL // AXIALLY SPLIT // CENTRELINE MOUNTED

- Horizontal, multi-stage
- Axially Split opposed impeller design
- Double Suction Impeller available (MSND)
- Centerline mounted Oil Lube
- \*150 bar MAWP Std
- Complete Element balanced as an assembly

\* Customer approval required [6.3.9]  
• > 100bar • >200°C • SG < 0.7

STANDARD CONSTRUCTION:

- Temperatures to 200°C
- Pressures to 150 barg as standard – Higher Pressure Ratings Optional



**\* BB4 Multi-Stage**

BETWEEN BEARINGS // HORIZONTAL // RADIALLY SPLIT // SINGLE CASING

- Horizontal, multi-stage
- Radially Split
- Multiple external leakage paths between stages
- Element not balanced as assembly
- Normally Balance Disc or Balance drum to compensate for high axial thrust

\* Not compliant with API 610



**BB5 Multi-Stage UNITED DDHF**

BETWEEN BEARINGS // HORIZONTAL // DOUBLE CASING // RADIALLY SPLIT // CENTRELINE MOUNTED

- Horizontal, multi-stage Double Case Barrel
- Radially Split Pressure Containment
- \*Axially Split Inner Casing – opposed impellers
- \*Rotating element balanced as an assembly
- Centerline mounted Oil Lube
- Up to 255bar MAWP as std.
- Double Suction Impeller available
- Complete element balanced as an assembly
- Spare cartridge capability for rapid changeover

\*Unlike cheaper “pancake” style internals

STANDARD CONSTRUCTION:

- Temperatures to 200°C – uncooled
- Temperatures to 450°C – with cooling
- Pressures to 425 barg as standard – Higher Pressure Ratings Optional

**VS1 // VS2 // VS3**  
VERTICALLY SUSPENDED  
UNITED VCMS // VCD // VSP

DISCHARGE THROUGH COLUMN // DIFFUSER (VS1) // VOLUTE (VS2) // AXIAL FLOW (VS3)

- VS1, VS2, VS3 are equivalent functionally
- Discharge through the central column lubricates the shaft seal
- Radially Split Casings and column joints with confined gaskets
- Thrust can be taken by the driver or a separate bearing housing
- Available with a gasketed footplate for installation in a pressure vessel
- Multi or single stage

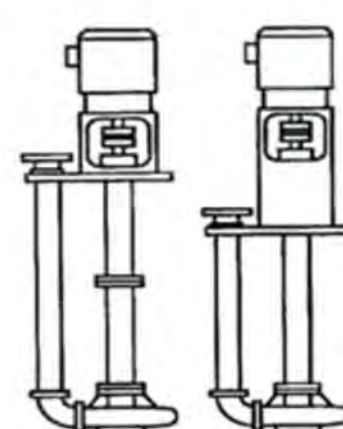


**\* VS4 // VS5**  
VERTICALLY SUSPENDED

SEPARATE DISCHARGE // LINESHAFT (VS4) // CANTILEVER (VS5)

- VS4 uses a volute wet end with pumped product lubricated bushings for shaft location. – \*Not recommended for heavy duty service (use VS1, VS2, VS3)
- VS5 uses a large cantilevered shaft with all bearings above the footplate –  $N_c$  limits available setting depth
- Discharge is separate from the column – difficult to seal the footplate / column – piping strain will misalign the shaft & column

\* United do not believe that VS4 style pumps are sufficiently robust for API 610 continuous service life compliance.



**VS6 // VS7**  
UNITED VCMS // VCD // VSP

DOUBLE CASING // DIFFUSER (VS6) // VOLUTE (VS7)

- VS6, VS7 are equivalent functionally
- Discharge through the central column lubricates the shaft seal
- Radially Split Casings and column joints with confined gaskets
- Suction barrel or “can” may be extended to facilitate deep first stage placement for very low NPSHR
- Thrust can be taken by the driver or a separate bearing housing
- Multi or single stage



Normally used for low NPSH applications: VS6 Diffuser Style

## MATERIAL CODES SIMPLIFIED SUMMARY ONLY – REFER API 610 TABLE H.1

	UNITED PUMPS AUSTRALIA - COMMON MATERIAL CLASSES										
	S-1	S-3	S-4	S-5	S-6	S-8	S-9	C-6	A-8	D-1	D-2
Pressure Casing	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel	13%Cr -4Ni	316SS	DUPLEX	SUPER DUPLEX
Inner Casing	C.I.	Ni-Resist	C.I.	Carbon Steel	13%Cr -4Ni	316SS	Ni-Cu alloy	13%Cr -4Ni	316SS	DUPLEX	SUPER DUPLEX
Impeller	C.I.	Ni-Resist	Carbon Steel	Carbon Steel	13%Cr -4Ni	316SS	Ni-Cu alloy	13%Cr -4Ni	316SS	DUPLEX	SUPER DUPLEX
Case Rings	C.I.	Ni-Resist	C.I.	420ss	420ss	Hard Faced 316ss	Ni-Cu alloy	420ss	Hard Faced 316ss	Hard Faced DUPLEX	Hard Faced SUPER DUPLEX
Impeller Rings	C.I.	Ni-Resist	C.I.	420ss	420ss	Hard Faced 316ss	Ni-Cu alloy	420ss	Hard Faced 316ss	Hard Faced DUPLEX	Hard Faced SUPER DUPLEX
Shaft	*4140 Alloy	*4140 Alloy	*4140 Alloy	*4140 Alloy	*4140 Alloy	#316ss	Ni-Cu alloy	431ss	#316ss	DUPLEX	SUPER DUPLEX
Bushes	C.I.	Ni-Resist	C.I.	420ss	420ss	Hard Faced 316ss	Ni-Cu alloy	420ss	Hard Faced 316ss	Hard Faced DUPLEX	Hard Faced SUPER DUPLEX
Steeves	C.I.	Ni-Resist	C.I.	420ss	420ss	Hard Faced 316ss	Ni-Cu alloy	420ss	Hard Faced 316ss	Hard Faced DUPLEX	Hard Faced SUPER DUPLEX

\*United Pumps Australia recommend 431ss as a no cost upgrade over 4140 Alloy. #United Pumps Australia recommend Duplex ss as a no cost upgrade over 316ss.



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