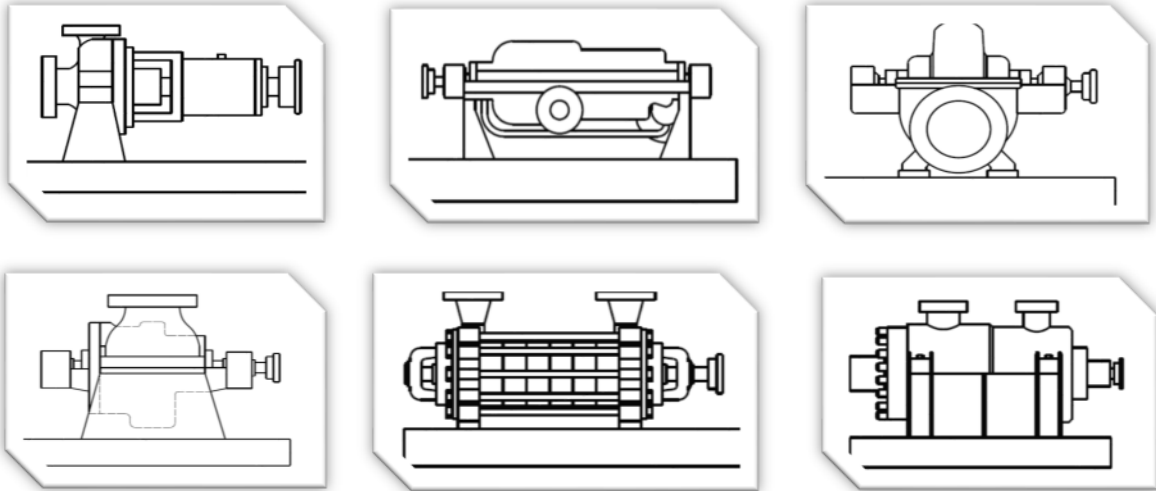
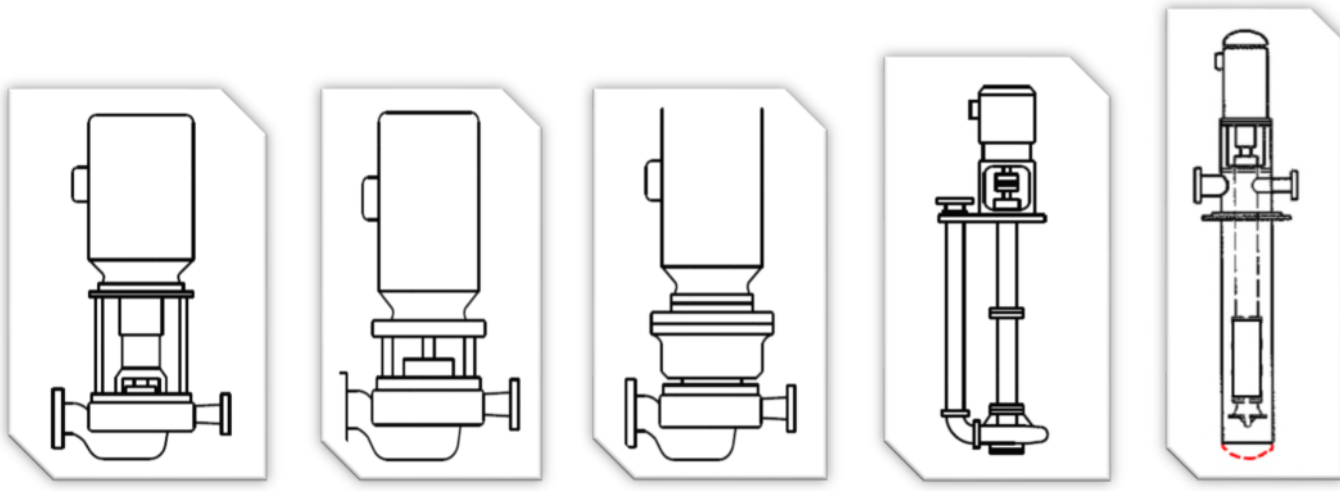


Comparison Between Horizontal and Vertical Centrifugal Pump

	Horizontal Pump	Vertical Pump
		
Defining parameters	Pump shaft orientation is horizontal.	Pump shaft orientation is vertical.
Similarity	Working principle of Centrifugal pumps remain the same. Specific speed options and radial / mixed / axial flow options are available. Both can have different impeller configuration like open / semi open / closed / Closed. Both can have volute or diffuser casing. All three sealing methods (GP, Mechanical seal, Sealless) are available in both the options.	
What all API Pump types it covers	OH1, OH2 → Horizontal overhung pump BB1 to BB5 → Between bearing single / multistage pump	OH3, OH4, OH5 → Vertical inline pump (Flexibly coupled, rigidly coupled, close coupled) OH6 → High speed Integrally geared pump (also available in horizontal design) VS1 to VS& → Vertical suspended pump
Footprint	Larger Footprint is required.	Small footprint. Perfect option when space is limited. E.g. offshore Platform
Headroom and other installation requirement	Low headroom required Piping and installation are more complex than vertical OH, inline pump design. Precision adjustment, alignment is necessary among pump, piping and motor mounting.	Tough to accommodate for indoor application due to requirement of higher headroom. Additional pit barrel is required for VS pump. OH3-6 pumps are easy to install, being inline design can be simply suspended like a valve in piping works.
Maintenance	Maintenance is easy and user friendly as impeller and mechanical seal, bearings are accessible without disturbing piping in OH and some of the BB pumps.	Maintenance of vertical OH pumps is not difficult but little different over horizontal pump. VS pump maintenance is lengthy and troublesome.
Coupling and alignment	During every inspection or maintenance job of pump or motor, coupling alignment and DBSE check is necessary.	In some of OH pumps (Direct drive, rabbet fit b/w motor and adaptor) avoids alignment and DBSE check point
Radial / Thrust load	Rolling element and hydrodynamic both the options are available to handle radial and axial load. Between bearing design is available to reduce and simplify excessive hydraulic force management	Challenging to handle high thrust load in OH3-5 design that can be handled through unconventional solution. OH6 available with all kind radial / thrust bearing options. Line shafts of VS type pumps are radially supported by steady bearing, commonly lubricated by pumping fluid. Shaft wobbling or lack of proper lubrication are common cause of concern, lead to high vibration and poor reliability.
Power rating	No limit	Not possible for very high-power rating as vertical motor stand design, installation and maintenance is challenging.
Suction and discharge Orientation	Top suction top discharge, End suction top discharge, Side suction side discharge or any customised configuration	OH3-6 pumps are inline design saves space and easy to install.
Split type	Axially and radial split	Radial split
Drivers types	No issue with any driver types	Good for motor drive. Turbine and engine drive are challenging
NPSH and Priming	Not good for narrow NPSH margin, cannot be used if negative NPSH at ground level	Vertical design marginally Improves NPSH available VS pumps are the only option when NPSH is very low or negative at ground level
Sealing method / Mechanical Seal	All prevailing sealing methods, mechanical seal types / arrangement alongwith seal plan are feasible. Non-API and API 685 complied Sealless technology pumps are normally in horizontal configuration BB pumps require 2 sets of mechanical seals alongwith associated seal systems.	Proper venting is utmost important, Challenging When pumping liquids contain high concentrations of dissolved gases. External clean flush is required in some of the VS pump to protect seal against dry running mainly during start up.
Storage of rotor / Shaft	Manual shaft rotations at regular interval is required for pumps with thin shaft or heavy rotor when it is under long term preservation or standby for extended time period to avoid sag / bow of rotor.	Such precautionary actions are not required for vertically installed or stored machine. Spare shaft of VS pump must be stored vertically.
Application	OH1 and OH2 are very basic design handle majority of industrial applications like transfer pump, loading / unloading pump. BB pumps: Boiler feed pump, High pressure pipeline pump, Colling water pump in utility, Sea water injection in oil wells, High pressure Feed pump in Refinery, fertilizer and petrochemical	VS: Sump pump, Sea water intake, Condensate extraction, Tank farm, OH3-5: High temperature or cryogenic application, HVAC OH6: Wash water pump, High pressure application water injection, wash down, feed pump