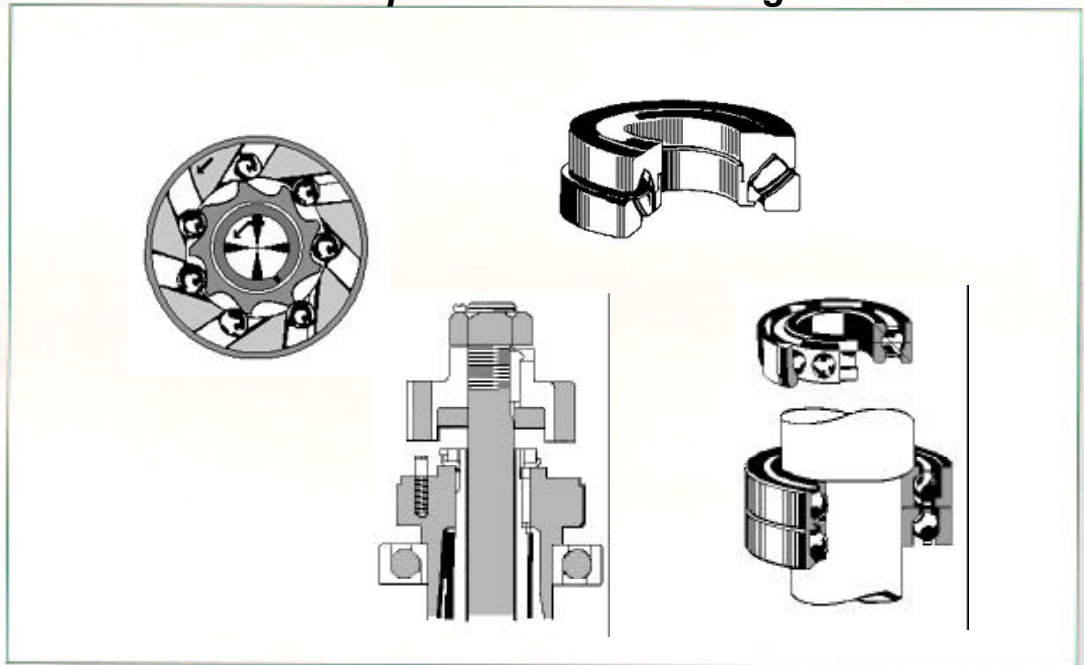


Product Data Sheet

Vertical Motor Accessories *Special Features for High Thrust Motors*



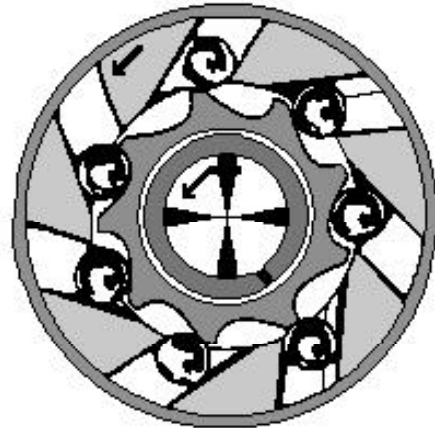
- **Non-Reverse Ratchet**
- **Self-Release Couplings**
- **Steady Bushings**
- **Angular Contact Thrust Bearings**
- **Spherical Thrust Bearings**
- **Plate Bearings**



Non-Reverse Ratchet and Self Release Couplings

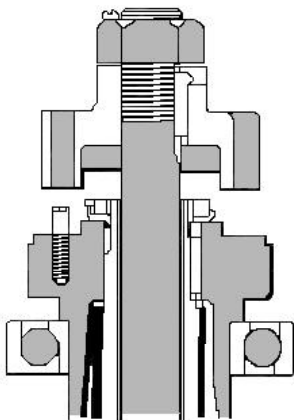
Non-Reverse Ratchet

U.S. Electrical Motors' Non-Reverse Ratchet (NRR) is typically used in deep well applications where water lubricated pump bearings are installed. The Non-Reverse Ratchet provides immediate protection against reversing due to phase reversals or from backspin at shutdown. USEM's standard Non-Reverse Ratchet is for counterclockwise shaft rotation when viewed from the top of the motor. The NRR stops the shaft while the pump water column is receding. As the water flows back into the well and the water level drops below the upper shaft bearings, the pump will operate dry. If allowed to run dry for any period of time, failure would occur. Many oil lubricated pumps use this feature to prevent backflow that could lead to destructive vibration and other application related phenomena.



All U. S. Motors' Ball-O-Matic ratchets are good for any depth setting. Non-Reverse Ratchets can be applied to high thrust solid shaft, and hollow shaft motors when required. A special Non-Reverse Ratchet for clockwise rotation is available for WPI units on frames 320 through 9600. USEM's ratchets are non-sparking and do not require special materials for explosionproof applications. Note that a Non-Reverse Ratchet is also available for enclosed motors on 180 frame and larger. Please note that a non-reversing ratchet is not available on 2-pole machines above 360 frame.

Self Release Couplings



U.S. Motors' Self Release Couplings (SRC) are balanced and mounted on three pins on the thrust bearing mount. This design feature prevents the pump line-shaft from completely unscrewing in the event of a power failure or phase reversal. Should the pump spin fast enough in reverse to begin to unscrew the shaft, the drive coupling will lift up off its pins and spin with the pump shaft. This is a safety feature to keep from damaging the pump and line shaft. In most cases, our customers call for 30% momentary upthrust. This means the coupling must be bolted to handle this condition. The coupling is no longer capable of self-release. If upthrust and non-reversing protection are both required, a Non-Reverse Ratchet should be specified.

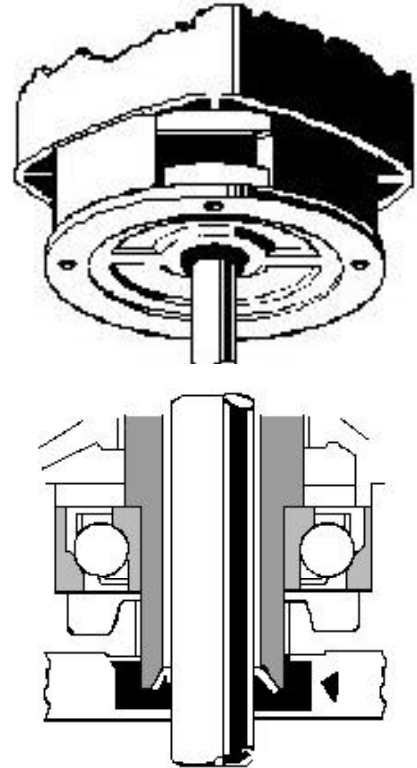
Steady Bushing and High Thrust Bearings

Steady Bushing

A Steady Bushing is available for Holloshaft® motors to support the head shaft at the lower end of the motor. This effectively supports the head shaft to prevent whip against the pump seal. When a motor is connected to the pump, the motor shaft, pump shaft and steady bushing all rotate together and have the mechanical stability of a vertical solid shaft motor.

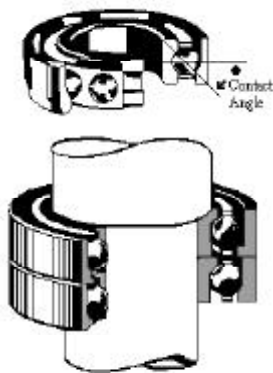
On grease lubricated lower bearings, the shaft slinger is removed and a bushing installed on the Holloshaft® with the same bore dimensions as the top coupling. Steady bushing kits for field installation are available from 213TP through 5008 frame on WPI motors and 182TP through 447 frame for TEFC motors.

Motors with oil lubricated lower bearings generally use a bronze bushing pressed into the lower end of the Holloshaft® just above the oil tube. This requires special machining at the time of manufacture and cannot be field-mounted.



High Thrust Bearings

Angular Contact Thrust Bearings



Angular Contact Thrust Bearings are standard on all high thrust ratings. The amount of thrust capacity for a given bearing is determined by the angle of contact and types used. Turbine Pump motors usually have a 35 to 40° angle. A factor which can influence bearing life is construction of the retainer which guides the balls. Since thrust bearings maintain a continuous load on each ball, any variation in speed must be corrected by the retainer. Angular contact thrust bearings can handle continuous thrust in only one direction.

Angular contact bearings can be stacked for increased thrust capacity. The bearings must be accurately ground so they will share the load. Two bearings will give approximately 165% of the capacity of one bearing. Also, angular contact bearings are seldom water-cooled.

Spherical Roller Bearings and Plate Bearings

Spherical Roller Bearings

U.S. Motors' Spherical Roller Bearings are used when higher bearing life or thrust capacity cannot be provided by angular contact bearings. This bearing will take some radial load but only if thrust is applied at all times. USEM employs spring loading to insure the bearings will not be damaged during starting and momentary upthrust conditions. These springs push up against the lower race to ensure that it is kept in contact. Since the spring pressure may be several thousand pounds, a considerable load is imposed on the guide bearing during start-up. Care must be taken not to specify life factors that would cause bearing failures due to insufficient loading during normal operation. This includes variable speed applications, where reduced speed can drop the load and the thrust below minimum acceptable levels. This design requires more oil circulation than ball bearings, and is maintained in the design of the motor.

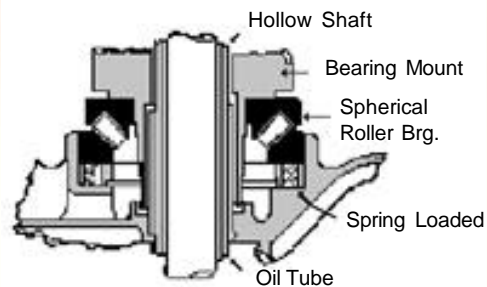
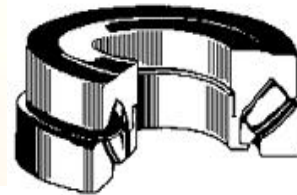
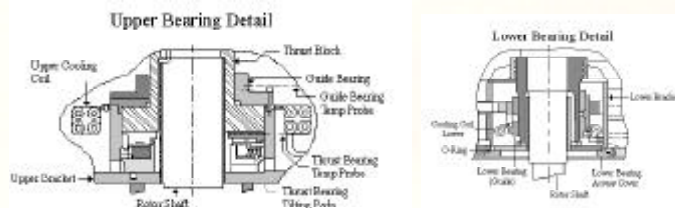


Plate Bearings

U.S. Motors' Plate Bearings have a theoretically unlimited life factor if the thrust capacity is properly selected, lubricated, cooled and not overloaded. Plate type bearings offer the highest thrust carrying capacity of all configurations offered. Unlike rolling element bearings, these operate on an oil film and have little if any overload capacity. Overload will quickly result in failure. Vibration, cavitation and heat can also severely affect the life of a plate bearing. Construction of this bearing calls for a solid plate runner and segmental pivoted shoes with the runner riding on a film of oil between it and the bearing shoes.

The guide bearings are usually ball for the 6800 frame and sleeve for ratings larger than 6800. It is extremely important that all thrust conditions, including shutoff, be given at the time of inquiry. Of the three types of bearings used on high thrust machines, plate bearing efficiencies must be quoted with thrust losses. Plate bearing efficiencies are considerably lower than spherical bearing efficiencies and water cooling is required.



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