

INNOVATORS AND GLOBAL MANUFACTURERS OF POWERTRAIN SOLUTIONS

**OMNI**<sup>TM</sup>

**POWERTRAIN TECHNOLOGIES**

VERTICAL HOLLOW SHAFT MOTOR  
**OPERATION AND  
MAINTENANCE**

— M A N U A L —



**OMNIGEAR**<sup>®</sup>

# OMNI™/ OMNIGEAR® VERTICAL HOLLOW SHAFT MOTORS

**OMNI Powertrain Technologies™** Vertical Hollow Shaft Motors are specifically designed for driving deep-well water pumps and provide quiet, reliable irrigation solutions suitable for both conventional and high-thrust setups. With high starting torque and low vibration, our three-phase squirrel cage induction motors are open-drip proof and come standard with WP-1 protection.

## OPERATING CONDITIONS

**Duty:** Continuous duty (SI)

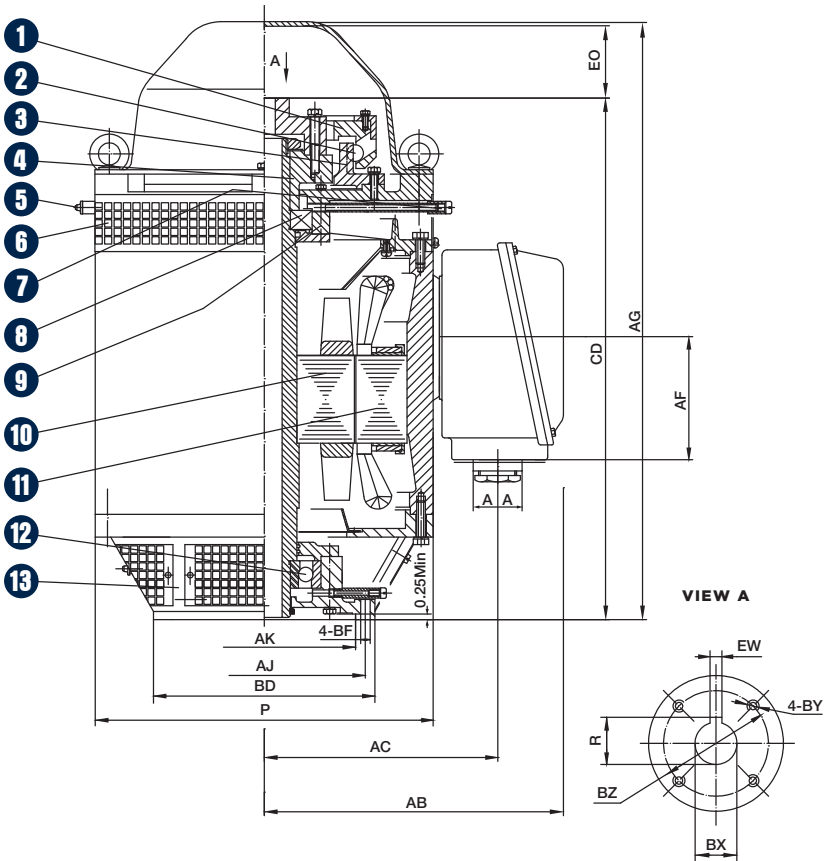
**Ambient temperature:** Not to exceed 40° C

**Altitude:** Not to exceed 3300 feet above sea level at 40° C

VERTICAL HOLLOW SHAFT MOTOR SPECIFICATIONS	MODEL	Rated Output (hp/kw)	Protection Detree	Angular Contact Bearing (Type)	Radial Ball Bearing (Type)	Max Thrust Load Allowable	
						(N)	(lbs.)
						VHS10-215TP	10/7.5
VHS15-254TP	15/11	7312B	6212	14234	3200		
VHS20-254TP	20/15	7312B	6212	14234	3200		
VHS25-284TP	25/18.5	7312B	6212	14234	3200		
VHS30-286TP	30/22	7312B	6212	14234	3200		
VHS40-324TP	40/30	7221B	6213	24496	5500		
VHS50-326TP	50/37	7221B	6213	24496	5500		
VHS60-364TP	60/45	7224B	6314	24937	5600		
VHS75-365TP	75/55	7224B	6314	24937	5600		
VHS100-404TP	100/75	7230B	6317	29842	6700		
VHS125-405TP	125/90	7230B	6317	29842	6700		
VHS150-444TP	150/110	7232B	6318	35630	8000		
VHS200-445TP	200/150	7232B	6318	35630	8000		
VHS250-445TP	250/185	7232B	6318	35630	8000		
VHS300-5006P	300/225	7236B/DT	6322	63782	14350		
VHS350-5006P	350/260	7236B/DT	6322	63782	14350		
VHS400-5008P	400/300	7236B/DT	6322	63782	14350		
VHS405-5008P	450/335	7236B/DT	6322	63782	14350		
VHS500-5008P	500/375	7236B/DT	6322	63782	14350		

# GENERAL ARRANGEMENT & SPECIFICATIONS

## 10HP-30HP MODEL, VHS MOTOR

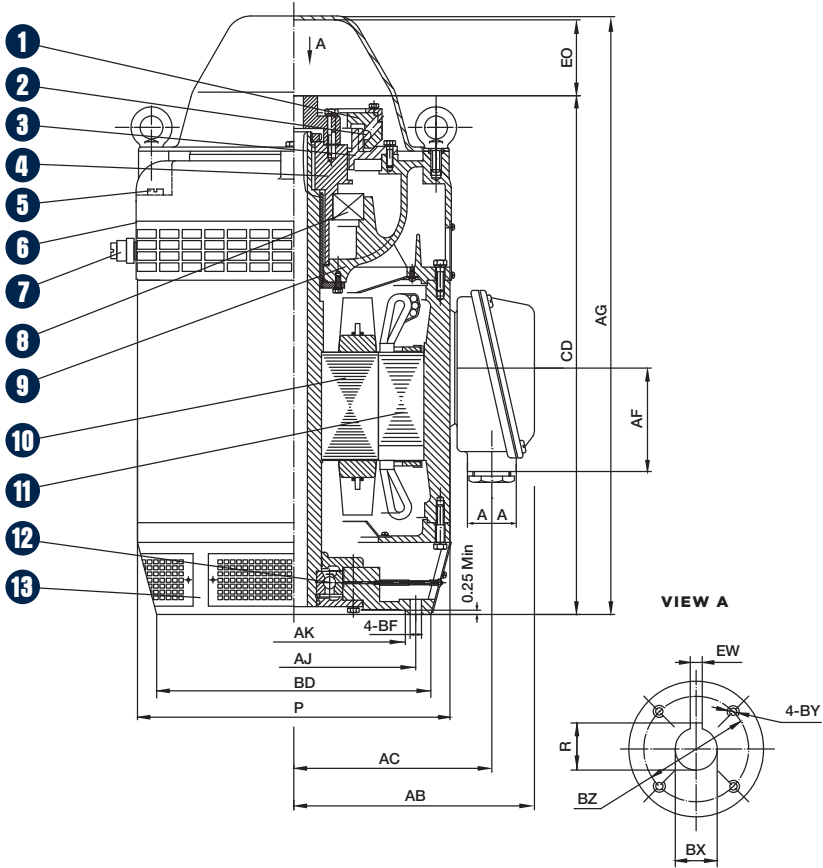


### FEATURES / BENEFITS:

- |                              |                         |
|------------------------------|-------------------------|
| 1. Non-Reverse Flange        | 8. Radial Ball Bearing  |
| 2. Steel Ball                | 9. End Bracket          |
| 3. Non-Reverse Ratchet Plate | 10. Rotor               |
| 4. Bearing House             | 11. Stator              |
| 5. Oil Fill Plug             | 12. Radial Ball Bearing |
| 6. Oil Gauge                 | 13. Base                |
| 7. Oil Drain                 |                         |

# GENERAL ARRANGEMENT & SPECIFICATIONS

## 40HP-500HP MODEL, VHS MOTOR



### FEATURES / BENEFITS:

- |                              |                            |
|------------------------------|----------------------------|
| 1. Non-Reverse Flange        | 8. Angular Contact Bearing |
| 2. Steel Ball                | 9. End Bracket             |
| 3. Non-Reverse Ratchet Plate | 10. Rotor                  |
| 4. Bearing House             | 11. Stator                 |
| 5. Oil Fill Plug             | 12. Radial Ball Bearing    |
| 6. Oil Gauge                 | 13. Base                   |
| 7. Oil Drain                 |                            |

# MOUNTING PRECAUTIONS

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**BEFORE MOUNTING THE VHS MOTOR, CAREFULLY CHECK ALL DATA ON THE MOTOR NAMEPLATE TO BE CERTAIN ALL OF THE APPLICATION REQUIREMENTS ARE MET.**

- 1.** Inspect the motor carefully to ensure all parts are assembled in good condition and that no fasteners, bolts, or nuts have become loose or detached during transportation. Turn the motor shaft in the indicated direction by hand to make sure the rotor rotates freely.
  
- 2.** Measure the phase-to-phase and phase-to-ground insulation resistance by using a 500 V Megger. The reading should not be less than 0.5 Meg ohms. If the reading is less than 0.5 Meg ohms, the stator windings must be dried. To dry the motor, disassemble the motor and dry it in an oven, maintaining the temperature at around 100°C. The heating process should last 12 to 24 hours. If there is no drying oven available, incandescent lamps may be placed inside and around the motor for the same purpose. A third way to dry the motor is to apply a low voltage (about 10% of the rated value) to the stator windings with the rotor locked. Drying will be accomplished by the current generated heat. In either of the latter two cases, precautions must be taken not to overheat the windings.
  
- 3.** Before mounting, it is necessary to run the motor at no load.
  - a)** Remove the oil fill plug and fill with ISO 32/ISO 68 Oil to the middle of the sight gauge.
  
  - b)** The motor's wiring diagram is located on the left side of the nameplate. After connecting the terminals, the motor may be run at no load. If the motor does not start, turn off the power immediately, and interchange any two of the line connections. If the motor still does not turn, check the power supply circuit.
  
  - c)** When the motor is run for the first time and has reached the rated speed, cut the power off and re-inspect. Check that no connections are loose. Make adjustments as necessary.

- d) Running at no load should continue for 2 to 3 hours. During this period, check for any irregularities or unusual noise. After completion of this trial, inspect the bearings thermally to ensure that they have not been over-heated.
- e) Drain the oil into a clean container. The oil can be reused once the motor is mounted.

## MOUNTING THE MOTOR

1. Make sure that the specifications and the capacity of the starting equipment meet the requirements on the nameplate.
2. Drain the oil in the motor's oil reservoir before lifting. When lifting the motor, be sure to attach the hooks of the crane to the lifting lugs of the motor.
3. During the course of the installation, the motor should be handled carefully and placed vertically. **NEVER LAY THE MOTOR ON ITS SIDE.**
4. When lifting the motor to the pump, proper safety procedures should be used at all times.
5. Refill the oil chamber with oil prior to operation.

## OVERALL DIMENSIONS

	MODEL	OVERALL DIMENSIONS		
		P	AB	AG
VERTICAL HOLLOW SHAFT OVERALL DIMENSIONS	VHS10-215TP	15.24	14.39	26.80
	VHS15-254TP	15.24	14.39	26.80
	VHS20-254TP	15.24	14.39	26.80
	VHS25-284TP	15.24	14.39	26.80
	VHS30-286TP	15.24	14.39	26.80
	VHS40-324TP	17.32	15.44	32.70
	VHS50-326TP	17.32	15.44	32.70
	VHS60-364TP	19.10	16.32	36.00
	VHS75-365TP	19.10	16.32	36.00
	VHS100-404TP	21.00	17.30	42.20
	VHS125-405TP	21.00	17.30	42.20
	VHS150-444TP	23.30	20.70	50.29
	VHS200-445TP	23.30	20.70	50.29
	VHS250-445TP	23.30	20.70	50.29
	VHS300-5006P	28.98	27.38	57.75
	VHS350-5006P	28.98	27.38	57.75
VHS400-5008P	28.98	27.38	61.88	
VHS405-5008P	28.98	27.38	61.88	
VHS500-5008P	28.98	27.38	61.88	

Reference page 3-4, VHS Motor schematics

# MOUNTING DIMENSIONS

VERTICAL HOLLOW SHAFT MOUNTING DIMENSIONS	MODEL	MOUNTING DIMENSIONS										
		BD	AJ	AK	BF	BX	BZ	EW	R	BY	CD	EO>
	VHS10-215TP	10.0	9.125	8.25	0.44	1	1 3/8	1/4	1.130	10-32	17.56	3.22
	VHS15-254TP	10.0	9.125	8.25	0.44	1	1 3/8	1/4	1.130	10-32	23.38	3.22
	VHS20-254TP	10.0	9.125	8.25	0.44	1	1 3/8	1/4	1.130	10-32	23.38	3.22
	VHS25-284TP	10.0	9.125	8.25	0.44	1	1 3/8	1/4	1.130	10-32	24.75	3.22
	VHS30-286TP	10.0	9.125	8.25	0.44	1	1 3/8	1/4	1.130	10-32	24.75	3.22
	VHS40-324TP	16.5	14.75	13.5	0.69	1 1/4	1 3/4	1/4	1.367	1/4-20	28.22	4.22
	VHS50-326TP	16.5	14.75	13.5	0.69	1 1/4	1 3/4	1/4	1.367	1/4-20	28.22	4.22
	VHS60-364TP	16.5	14.75	13.5	0.69	1 1/4	1 3/4	1/4	1.367	1/4-20	31.16	4.56
	VHS75-365TP	16.5	14.75	13.5	0.69	1 1/4	1 3/4	1/4	1.367	1/4-20	31.16	4.56
	VHS100-404TP	16.5	14.75	13.5	0.69	1 1/2	2 1/8	3/8	1.668	1/4-20	36.94	4.56
	VHS125-405TP	16.5	14.75	13.5	0.69	1 1/2	2 1/8	3/8	1.668	1/4-20	36.94	4.56
	VHS150-444TP	16.5	14.75	13.5	0.69	1 11/16	2 1/2	3/8	1.854	1/4-20	42.66	5.40
	VHS200-445TP	16.5	14.75	13.5	0.69	1 11/16	2 1/2	3/8	1.854	1/4-20	42.66	5.40
	VHS250-445TP	16.5	14.75	13.5	0.69	1 11/16	2 1/2	3/8	1.854	1/4-20	42.66	5.40
	VHS300-5006P	24.5	14.75	13.5	0.69	1 11/16	2 1/2	3/8	1.854	1/4-20	49.76	8.10
	VHS350-5006P	24.5	14.75	13.5	0.69	1 11/16	2 1/2	3/8	1.854	1/4-20	49.76	8.10
	VHS400-5008P	24.5	14.75	13.5	0.69	1 15/16	2 1/2	1/2	2.162	1/4-20	53.9	8.10
	VHS405-5008P	24.5	14.75	13.5	0.69	2 3/16	3 1/4	1/2	2.412	3/8-16	53.9	8.10
	VHS500-5008P	24.5	14.75	13.5	0.69	2 3/16	3 1/4	1/2	2.412	3/8-16	53.9	8.10

Reference page 3-4, VHS Motor schematics

# OPERATION & INSTRUCTION

1. The motor should be grounded properly. An earth-connecting terminal is located inside the terminal box on the lower left.
2. The motor windings should be connected according to the wiring diagram on the motor's nameplate. Thermostats are embedded in the stator windings for thermal protection. The two leads coming from the thermostats in the terminal box marked with **TH1** and **TH2** should be connected to your control device. Additionally, this motor is equipped with heaters. The heaters are mounted on both ends of the stator winding. The two leads in the terminal box marked **H1** and **H2** are the heater connections. The heater should be connected to a 120VAC power source.
3. The motor's correct rotating direction is **counter clockwise** facing from the top of the motor.
4. The motor can be started at full voltage. If the motor is started at full voltage, the starting current will be 5 to 7 times of the full load current. Furthermore, the motor can be used with a variety of soft start applications. The locked-rotor torque is directly proportional to the square of the voltage. Check with the factory regarding appropriate soft start applications.
5. The starter should be provided with overcurrent and short circuit protection devices which will correspond with the current rating on the motor's nameplate.
6. The motor will operate continuously at its HP and RPM nameplate rating so long as the frequency of the sine wave does not vary by more than 1% and the voltage does not vary by more than 10%.
7. When the motor operates at full load, there should be no abnormal noise or vibration present.
8. The motors are designed with a class B or class F insulation system. The maximum allowable winding temperature rise is shown in the following table:

TEST METHODS	Stator winding Max. Allowable Temperature Rise	
RESISTANCE	80K (B Class)	105K (F Class)



# MAINTENANCE & STORAGE

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- 1.** The motor must have the oil changed and/or be regreased at regular intervals. If the motor is used seasonally, the motor should be regreased and the oil changed at the beginning of each season.
- 2.** The motor should be operated in a clean and dry environment. The surface of motor should be kept clean. The air inlet should not be blocked. No heat sources should be kept near the motor.
- 3.** In an outdoor environment when the motor is not operated continuously, the motor should be inspected for the presence of snakes, birds, and small animals before starting the motor.
- 4.** If abnormal noise occurs during operation, the motor should be shut down immediately and checked to determine the cause of the noise. Only after the issue has been resolved can the motor be put back into operation.
- 5.** The ratchet assembly should be inspected periodically for wear or contamination. If it fails to ratchet properly, inspect the ball channels and clean out any accumulated material.
- 6.** Bearings wear out over time. When vibration or noise start to occur in motors that have been in service for several years, the bearings should be checked. Allowing the motor to operate with failing bearings could lead to a catastrophic failure and the loss of the motor.
- 7.** Attention should be paid to the level of lubricating oil in the sight glass. When the oil level is below the middle of the sight glass, fresh oil must be added to ensure proper lubrication
- 8.** If located in a clean and dry environment, the bearings will not require regreasing and/or reoiling until they have been in service for about 4400 hours. Sealed bearings will not require grease changes during their service life. However, under the following conditions grease and oil must be changed at once:
  - a)** Caking or deterioration of the grease.
  - b)** Accumulation of water, impurities, or dust in the oil.
  - c)** Overheated bearing.

**9.** To change the lubricating grease and oil, the follow these steps: First remove the used lubricating grease and oil. Next, flush out the oil reservoir and the bearing with an appropriate solvent. Finally, fill with fresh grease and oil. For the radial ball bearing, the amount of grease should fill about 2/3 of the bearing cavity.

**10.** The angular contact bearing is lubricated with turbine oil with an appropriate viscosity for the region of operation. The radial ball bearing is lubricated with Exxon Mobil Polyrex EM grease.

**11.** In order to ensure normal operation, the motor must be overhauled periodically.

## **STORAGE**

**1.** When the motor is to be stored for a period of time, the following steps should first be taken:

**a)** Clean the exterior and interior of the motor thoroughly to free it of any contamination. Check all the parts to make sure that they are intact.

**b)** Loosely cover all air inlets and outlets to prevent debris from getting into the motor.

**c)** Coat all parts that are susceptible to rust with a layer of antirust oil or other rust preventers.

**2.** The motor should be packaged in the same manner as that of the manufacturer before storing. The storage place must be dry and well ventilated, and the temperature must be maintained above 0°C. The motor in storage should be checked periodically for signs of dampness and corrosion. Necessary steps must be taken to improve storage conditions if there are signs of deterioration.

# TROUBLESHOOTING

## MOTOR FAILS TO START

**Wrong direction of rotation:** Interchange any two phases to change direction.

**Single Phased:** Check starter, fuse, and wiring connections.

**Overload:** Reduce the load or select a larger capacity motor.

**Supply voltage too low:** Adjust to  $\pm 10\%$  of rated voltage.

**Pump trouble:** Check the pump.

## OPERATION SPEED W/LOAD IS LOWER THAN RATED

**Supply voltage too low:** Adjust to  $\pm 10\%$  of rated voltage.

**Broken bar of the cage rotor:** Replace the rotor.

**Overload:** Reduce the load or select a larger capacity motor.

**Pump trouble:** Check the pump.

## UNUSUAL SOUNDS/ BEARINGS OVERHEATING

**Single Phased:** Check the starter, fuse, and wiring connections.

**Bearings are low on oil:** Fill with fresh oil.

**Worn bearings:** Replace bearings

**Pump trouble:** Check the pump

## HIGH-PITCHED SOUND OR MOTOR OVERHEATING

**Overload:** Reduce the load or select a larger capacity motor.

**Single Phased:** Check the starter, fuse and wiring connections.

**Air passages are blocked:** Remove grass, dirt or debris in the air passage.

**Short between turns or phases:** Repair the windings.

**Supply voltage too low or high:** Adjust to  $\pm 10\%$  of rated voltage.

## NON-REVERSE RATCHET MALFUNCTIONS

**Dirt on steel ball:** clean steel ball

**Groove hole of non-reverse ratchet plate is worn:** Replace the non-reverse ratchet plate.

## RESERVOIR LEAKING OIL

**The motor was tilted during transport:** Remove the oil from the oil reservoir before shipping.

**Excessive oil in reservoir:** Reduce the oil level to the center of the sight glass.

**Oil conduit leaking:** Check the seal on the oil conduit.

# SHIFTING THE BALANCE OF POWER™

INNOVATORS AND GLOBAL MANUFACTURERS OF POWERTRAIN SOLUTIONS

**OMNI Powertrain Technologies™** has created the most compact, powerful, light-weight axial flux electric motor powertrain systems on earth. Innovation is our core value, and whether we are manufacturing mechanical drivelines for agricultural equipment, hydrostatic powertrain systems for off-highway equipment or state-of-the-art electric powertrain systems for commercial vehicles and motorsports, we strive to exceed the power and quality demanded by our clients no matter their industry.

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Our diverse family of manufacturing firms ensure that **OMNI™** always provides unparalleled service, distribution and support. From conception through development we have a single objective: to provide the highest performance electric, hydrostatic and mechanical powertrain systems that meet the objectives of our clients.

## OMNI™ POWERTRAIN TECHNOLOGIES

### AMERICA

3620 West 11th Street  
Houston, Texas 77008

Tel +1 713 635 6331  
Fax +1 713 635 6360

### ASIA

2455 Bao'an Highway  
Jiading Malu, Shanghai 201801

Tel +86 21 69153123  
Fax +86 21 69154218

### EUROPE

Via Giovanni, Rinaldi 105  
Reggio Emilia, Italy 42124

Tel +39 051 758517  
Fax +39 051 751575

WWW.OMNIPOWERTRAIN.COM

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