

# Hydrostatic Speed Variator K2, K4, K5 Units

Service & Installation Instructions

P-5059-TBW  
Form 1507



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**For future reference fill in the data tag below with information found on the unit itself.**

<b>H.S.V.</b>			
Model No.		Serial No.	
Part No.	MTG.	Input HP.	At R.P.M.
		<b>TB Wood's Incorporated</b>	
		Chambersburg, PA. USA	
MFGD. Under License From VAR-SPE s.p.a (ITALY)			

## Safety Notices

**Warning:** Rotating equipment must be properly guarded. Any rotating shaft must be fully enclosed by a stationary casing. It is the responsibility of the buyer to check all local regulations. Failure to comply with these provisions can lead to injury or damage of equipment.

**Warning:** TB Wood's HSV unit operates under high pressure. Never attempt to disassemble during operation and allow ample depressurization time for maintenance after use. Failure to do so can lead to injury or damage of equipment.

**Note:** Use of TB Wood's HSV drives on any device that maintains human life is strictly prohibited. This includes but is not limited to: man lifts, transportation devices, and filtration systems.

**Note:** Unit may differ from photos shown in this manual.

## General Operation of the HSV

The HSV unit is an integrated hydrostatic transmission device consisting of a variable displacement radial piston pump driving a fixed displacement radial piston motor. The pump-motor system is completely contained within one case, providing light weight, ease of maintenance and serviceability.

The hydrostatic closed loop operates in the following manner. The input shaft rotates the cylinder block of the radial piston pump. The pistons stroke in and out of their cylinders pumping hydraulic oil through the distributor shaft to the radial piston hydraulic motor. The oil then returns directly to the pump. In both the pump and the motor, the stroke of the pistons is limited by the eccentric rings. The position of the pump eccentric ring is controlled by the regulating pin. This varies the flow rate from the pump to the motor. Since the motor eccentric ring is fixed in place, the speed of the hydraulic motor is directly proportional to the flow received from the pump. The pump eccentric ring can be moved to either side of the concentric center position thereby reversing the flow and reversing the output shaft. When a torque load is applied to the output shaft a pressure proportional to the torque is produced in the passages which transmit oil from the pump to the hydraulic motor. Some internal leakage occurs in these high pressure sections causing slip. The low pressure return line is supplied by a small charge pump. It makes up for the small leakage and maintains a positive pressure (approximately 120 psi) at the inlet of the main pump. The charge pump also provides positive lubrication and power to the hydraulic controls. The crossover check valves direct the charge flow to the low pressure side of the closed loop. High system pressure is limited by the main relief valves. These provide protection from excessive torque overloads for both the variator and the driven machine. The input and output shafts are independently mounted in the end covers and coupled to the respective cylinder blocks. Consequently, no shaft deflections are transmitted to the hydraulic mechanism and no hydraulic forces are carried by the shaft bearings.



## Installation Requirements

**Warning:** Rotating equipment must be properly guarded. Any rotating shaft must be fully enclosed by a stationary casing. It is the responsibility of the buyer to check all local regulations. Failure to comply with these provisions may lead to injury or damage of equipment.

1. The HSV unit needs to be mounted on a solid base with adequate mounting area, capable of preventing vibrations.
2. The input and output shafts must be aligned with their respective equipment in order to ensure that there is a minimum amount of shaft loading.
3. The driving motor must be connected to the INPUT SIDE of the variator.
4. Refer to the shaft load capacities (Table 1) to make sure that all shaft loads are within tolerance.
5. When mounting equipment onto the input/output shafts avoid impact loading by using proper tools.
6. If installing a variator outdoors, provide adequate protection from the environment.
7. To ensure adequate cooling, leave sufficient space between the HSV and any obstructions.

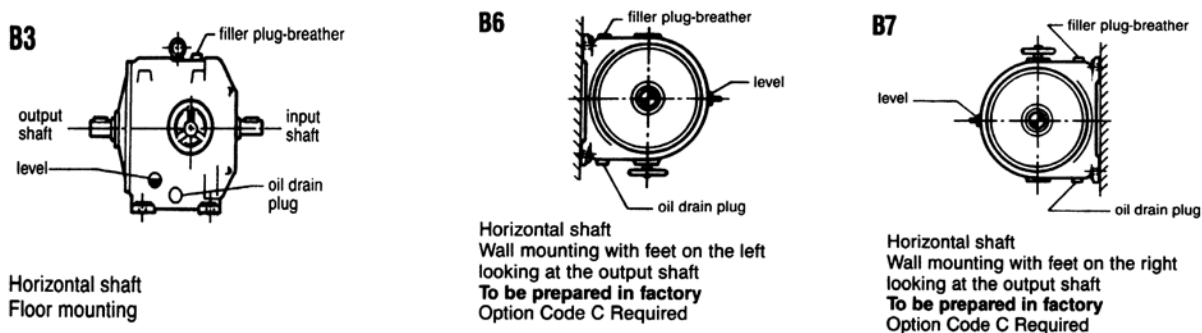
## Mounting Positions

The K2-K4-K5 HSV units are able to be mounted in any position shown below. There is no need for internal modification or an addition of oil.

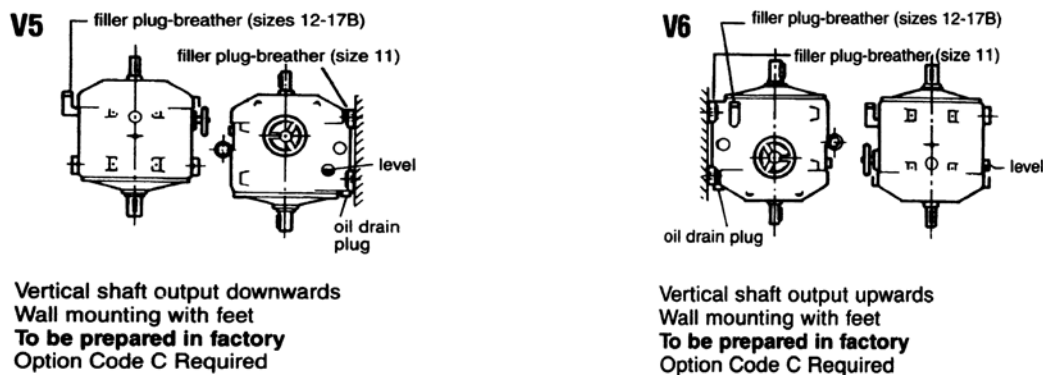
**Warning:** The variator cannot be mounted on the ceiling; doing so may permanently damage the unit.

**Caution:** When mounting variator unit be sure that the shaft load capacities are not exceeded. Doing so may cause the unit to fail. Refer to Table 1.

### Horizontal Mounting Positions (B) - Figure 1



### Vertical Mounting Positions (V) - Figure 2



## HSV Start-Up Procedures

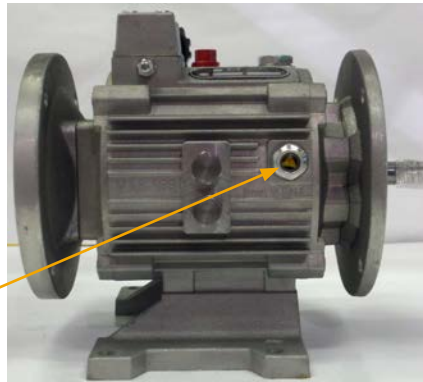
1. Some units are shipped from the factory with the breather plug hole sealed to avoid lubricant seepage during shipping. **The red plug must be removed and discarded. Install the breather plug before HSV start-up.** (See Figure 3)

**Figure 3**



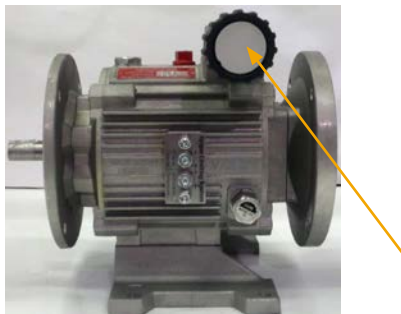
2. Before starting HSV, check the oil level at the sight port to make sure it is correct. Oil should be visible in sight port. (See arrow, Figure 4). If oil is not visible, add oil to proper level. Use the oil specification chart as a reference (Table 2).

**Figure 4**

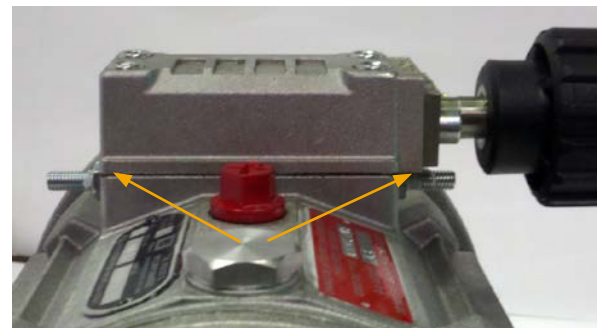


3. Use the Speed Control Device to vary the output RPM. Unless otherwise stated, the adjusting control offers progressive variations for both directions of rotation. (Figure 5, standard control shown) The speed range may be limited by adjusting the stop screws shown in Figure 6.

**Figure 5**

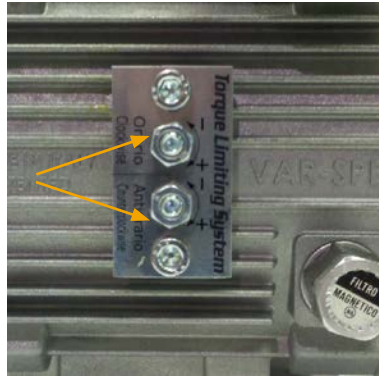


**Figure 6**



4. Use the Torque Limiter system (Figure 7) to set the maximum amount of allowable torque. Adjusting the screws clockwise will increase the speed and torque, adjusting the screws counter-clockwise will reduce the speed and torque.

**Figure 7**



5. A new unit should be run 15 to 20 minutes at low speed (900 to 1450 RPM) upon initial start-up with little or no load to provide proper break-in.
6. If installed in a cold environment (less than 5°F or -15°C) the HSV should be run at a lower speed for a few minutes to warm the oil at every start-up.
7. At full load the normal operating temperature of the HSV is 110°F (45°C) above ambient temperature.
8. The variator is best applied when output speed is equal to, or just above, the maximum speed required for the driven machine. Make sure, however, that this condition does not overload the variator. Electric motor amperage may run above name plate levels at full load when the HSV is new due to initial shaft seal drag and break-in. To check actual load on the HSV use a Code M pressure gauge. Consult with factory for details.

## HSV Maintenance Procedures

**⚠ Note:** The warranty will be voided if these servicing requirements are not followed.

1. Refer to the oil specifications (Table 3) and oil capacities (Table 2) chart to find the proper oil type and quantity for the HSV.
2. Change oil after first 200 hours of operation.
3. Change oil every 2,000 hours after initial break-in period. Extended intervals may be attained up to 4,000 hours by using synthetic oils rather than the standard mineral based oils.



**HSV Shaft Load Capacities - Table 1**

HSV Size	Input Shaft		Output Shaft	
	Axial (Lbs)	Radial (Lbs)	Axial (Lbs)	Radial (Lbs)
<b>K2 56C</b>	79	132	79	132
<b>K2 143C</b>	128	155	128	155
<b>K4 145TC</b>	185	240	185	204
<b>K5 182TC</b>	220	285	220	285

**HSV Oil Capacity - Table 2**

Variator Size	K2	K4	K5
<b>Quantity Qt. (L)</b>	.5 (.5)	1.6 (1.5)	2.1 (2)
<b>Quantity for V5 Qt. (L)</b>	.7 (.7)	1.9 (1.8)	2.4 (2.3)

**HSV Oil Specification - Table 3**

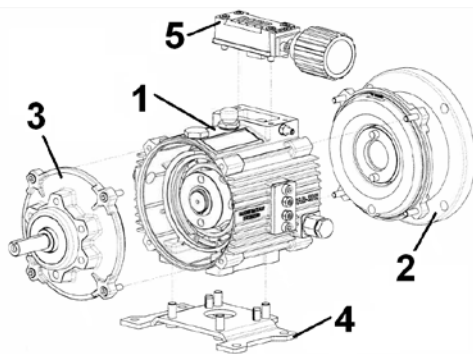
		Exxon Mobil	Agip	Shell	BP
<b>Ambient Temperature</b>	5°F / 35°F -15°C / 2°C	Univis N46	Arnica 46	Tellus T46	Bartran HV46
	35°F / 86°F 2°C / 30°C	Univis N68	Arnica 68	Tellus T68	Bartran HV68
	86°F / 104°F 30°C / 40°C	Ultron 5W-40 Mobil 10W-40	Sint Evolution 5W-40	Helix Ultra 5W-40	Visco 5000 5W-40

**⚠ Warning:** Never use the synthetic oil DEXRON ATF in a variator unit.

- (1) Electric oil preheater recommended for temperatures below 5°F (-15°C)
- (2) Oil cooler highly recommended for temperatures above 104°F (40°C)

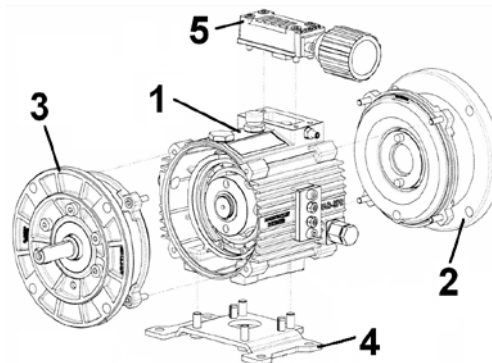
**Available Replacement Kits**

**Variator without Output Flange**



- 1. Modular Base Kit
- 2. Input Kit
- 3. Output Kit
- 4. Feet Kit
- 5. Speed Control Kit

**Variator with Output Flange**



- 1. Modular Base Kit
- 2. Input Kit
- 3. Output Kit with Flange
- 4. Feet Kit
- 5. Speed Control Kit

All Customer Service phone numbers shown in bold

Belted Drives and Sheaves	Couplings Cont.	Gearing	Linear Products
<p><b>TB Wood's</b> <i>Belted Drives</i> Chambersburg, PA - USA <b>1-888-829-6637</b> – Press #5 <i>For application assistance:</i> 1-888-829-6637 – Press #7</p>	<p><b>TB Wood's</b> <i>Elastomeric Couplings</i> Chambersburg, PA - USA <b>1-888-829-6637</b> – Press #5 <i>For application assistance:</i> 1-888-829-6637 – Press #7 <i>General Purpose Disc Couplings</i> San Marcos, TX - USA <b>1-888-449-9439</b></p>	<p><b>Bauer Gear Motor</b> <i>Gearred Motors</i> Esslingen, Germany <b>+49 (711) 3518-0</b> Middlesex, NJ - USA <b>1-732-469-8770</b></p>	<p><b>Warner Linear</b> <i>Linear Actuators</i> New Hartford, CT - USA <b>1-800-825-6544</b> <i>For application assistance:</i> 1-800-825-9050 Saint Barthélemy d'Anjou, France <b>+33 (0)2 41 21 24 24</b></p>
<p><b>Couplings</b></p>	<p><b>Electromagnetic Clutches and Brakes</b></p>	<p><b>Boston Gear</b> <i>Enclosed and Open Gearing, Electrical and Mechanical P.T. Components</i> Charlotte, NC - USA <b>1-800-825-6544</b> <i>For application assistance:</i> 1-800-816-5608</p>	<p><b>Overrunning Clutches</b></p>
<p><b>Ameridrives</b> <i>Mill Spindles, Ameriflex, Ameridisc</i> Erie, PA - USA <b>1-814-480-5000</b> <i>Gear Couplings</i> San Marcos, TX - USA <b>1-800-458-0887</b> <i>Universal Joints, Drive Shafts, Mill Gear Couplings</i> Erie, PA - USA <b>1-920-593-2444</b></p>	<p><b>Inertia Dynamics</b> <i>Spring Set Brakes; Power On and Wrap Spring Clutch/Brakes</i> New Hartford, CT - USA <b>1-800-800-6445</b></p>	<p><b>Nuttall Gear and Delroyd Worm Gear</b> <i>Worm Gear and Helical Speed Reducers</i> Niagara Falls, NY - USA <b>1-716-298-4100</b></p>	<p><b>Formsprag Clutch</b> <i>Overrunning Clutches and Holdbacks</i> Warren, MI - USA <b>1-800-348-0881</b> – Press #1 <i>For application assistance:</i> 1-800-348-0881 – Press #2</p>
<p><b>Bibby Turboplex</b> <i>Disc, Gear, Grid Couplings, Overload Clutches</i> Dewsbury, England <b>+44 (0) 1924 460801</b> Boksburg, South Africa <b>+27(0) 11 918 4270</b></p>	<p><b>Matrix</b> <i>Electromagnetic Clutches and Brakes, Pressure Operated Clutches and Brakes</i> Brechin, Scotland <b>+44 (0) 1356 602000</b> New Hartford, CT - USA <b>1-800-825-6544</b></p>	<p><b>Heavy Duty Clutches and Brakes</b></p>	<p><b>Marland Clutch</b> <i>Roller Ramp and Sprag Type Overrunning Clutches and Backstops</i> Warren, MI - USA <b>1-800-216-3515</b></p>
<p><b>Guardian Couplings</b> <i>Engineered Flywheel Couplings, Engine Housings and Pump Mounts, Flexible Shaft Couplings</i> Michigan City, IN - USA <b>1-219-874-5248</b></p>	<p><b>Warner Electric</b> <i>Electromagnetic Clutches and Brakes</i> New Hartford, CT - USA <b>1-800-825-6544</b> <i>For application assistance:</i> 1-800-825-9050 Saint Barthélemy d'Anjou, France <b>+33 (0)2 41 21 24 24</b> <i>Precision Electric Coils and Electromagnetic Clutches and Brakes</i> Columbia City, IN - USA <b>1-260-244-6183</b></p>	<p><b>Industrial Clutch</b> <i>Pneumatic and Oil Immersed Clutches and Brakes</i> Waukesha, WI - USA <b>1-262-547-3357</b></p>	<p><b>Stieber Clutch</b> <i>Overrunning Clutches and Holdbacks</i> Heidelberg, Germany <b>+49 (0) 6221-30470</b></p>
<p><b>Huco</b> <i>Precision Couplings and Air Motors</i> Hertford, England <b>+44 (0) 1992 501900</b> Chambersburg, PA - USA <b>1-888-829-6637</b></p>	<p><b>Engineered Bearing Assemblies</b></p>	<p><b>Svendborg Brakes</b> <i>Industrial Brakes and Brake Systems</i> Vejrstrup, Denmark <b>+45 63 255 255</b></p>	<p><b>Wichita Clutch</b> <i>Pneumatic Clutches and Brakes</i> Wichita Falls, TX - USA <b>1-800-964-3262</b> Bedford, England <b>+44 (0) 1234 350311</b></p>
<p><b>Lamiflex Couplings</b> <i>Flexible Couplings, Bearing Isolators, and Coupling Guards</i> Cotia, SP - Brasil <b>+55 (11) 4615-6300</b></p>	<p><b>Kilian</b> <i>Engineered Bearing Assemblies</i> Syracuse, NY - USA <b>1-315-432-0700</b></p>	<p><b>Twiflex</b> <i>Caliper Brakes and Thrusters</i> Wichita Falls, TX - USA <b>1-844-723-3483</b> Twickenham, England <b>+44 (0) 20 8894 1161</b></p>	<p><i>For information concerning our sales offices in Asia Pacific check our website www.altramotion.com.cn</i></p>



[www.tbwoods.com](http://www.tbwoods.com)

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