Integrated Hydrostatic Transmissions
HTE/HTJ/HTG Series
Catalog No. HY13-1595-002/US

Parker

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Excellence of Design

The producers of Parker Hannifin’s Integrated Hydrostatic Transmissions have a history of manufacturing reliable, precision parts that stretches back over a century. Milestones include the first patent on roller vane rotor sets for low speed, high torque hydraulic motors. That was forty years ago. Today, the technological advances continue.

In the Development Laboratory, engineers continuously measure and analyze pump and motor data to move existing products to even higher levels of performance, and develop new products that serve the ever changing needs of our customers. Design integrity is assured by exhaustive testing on endurance test stands. To be sure that this translates into superior performance, advanced manufacturing techniques are employed as well.

Excellence of Manufacturing

Central to manufacturing excellence is the understanding that quality parts make quality transmissions. The instrumentation in our Quality Assurance laboratory includes devices such as coordinate measuring machines, to accurately measure the parts that we manufacture as well as those that we purchase. Quality cannot be “inspected-in”; it must be manufactured. Each machine operator is responsible for the quality of the part that comes off that machine. Efficiency is enhanced by our cellular manufacturing techniques. Accuracy is assured by statistical process control methods. Micrometers and specialized gages are at the disposal of the operator. As a final check, every transmission is tested before shipment to our customer. Parker understands that our customers cannot produce quality products unless we do.
Parker’s Integrated Hydrostatic Transmissions provide a compact, economical solution for the propulsion systems of off-highway vehicles up to 2500 pounds gross vehicle weight. One integrated package contains the hydrostatic pump, reservoir, filter and standard of the industry low speed, high torque motor. Bolt it to the vehicle, put on the wheels and you’re ready to go.

And, your vehicle will be going with a transmission that performs with up to 10% more overall efficiency than competitive offerings. This means more horsepower to the deck or other functions, and more hill-climbing capability.
HTE Series Integrated Hydrostatic Transmission

Features
- Integrated pump/motor assembly
- Integral charge pump – 2.1 cc/rev
- Easy-to-service filter
- No expansion tank required
- Fan and pulley included
  - 5" pulley standard
    - 4" optional
  - 7" fan standard
    - 6" optional with 4" pulley
- Integral reservoir (approx 0.5 gal)
- Parking brake optional
- Fluid filled for life
- Return-to-neutral options
- Integral shock valves optional

Schematic Symbol

<table>
<thead>
<tr>
<th>Pump</th>
<th>cc/rev</th>
<th>10.2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cu in/rev</td>
<td>0.623</td>
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</table>

<table>
<thead>
<tr>
<th>Motors</th>
<th>130</th>
<th>163</th>
<th>195</th>
<th>228</th>
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Integrated Hydrostatic Transmission
HTE Series

Ordering Information

Shock Valves & Orifices

<table>
<thead>
<tr>
<th>Code</th>
<th>Wheel Hub</th>
<th>Brake Lever</th>
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<tr>
<td>0</td>
<td>1&quot; tapered output shaft</td>
<td>No brake</td>
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<tr>
<td>4</td>
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<td>Drum Brake - two hole lever</td>
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<tr>
<td>5</td>
<td>5-bolt hub</td>
<td>Drum Brake - one-hole lever</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAAB</td>
<td>Unpainted — Motor subassembly painted, other surfaces left unpainted.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Forward</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Shock Valve - no orifice</td>
</tr>
<tr>
<td>M</td>
<td>Shock Valve -.018&quot; orifice</td>
</tr>
<tr>
<td>L</td>
<td>Shock Valve -.024&quot; orifice</td>
</tr>
<tr>
<td>K</td>
<td>Shock Valve -.031&quot; orifice</td>
</tr>
<tr>
<td>J</td>
<td>Check Valve - no orifice</td>
</tr>
<tr>
<td>H</td>
<td>Check Valve -.018&quot; orifice</td>
</tr>
<tr>
<td>G</td>
<td>Check Valve -.024&quot; orifice</td>
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<td>F</td>
<td>Check Valve -.031&quot; orifice</td>
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<tr>
<td>E</td>
<td>Check Valve -.044&quot; orifice</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Forward</th>
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</thead>
<tbody>
<tr>
<td>M</td>
<td>Shock Valve -.018&quot; orifice</td>
</tr>
<tr>
<td>L</td>
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</tr>
<tr>
<td>K</td>
<td>Shock Valve -.031&quot; orifice</td>
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<tr>
<td>H</td>
<td>Check Valve -.018&quot; orifice</td>
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<tr>
<td>G</td>
<td>Check Valve -.024&quot; orifice</td>
</tr>
<tr>
<td>F</td>
<td>Check Valve -.031&quot; orifice</td>
</tr>
<tr>
<td>E</td>
<td>Check Valve -.044&quot; orifice</td>
</tr>
</tbody>
</table>

*Consult factory for other available shafts/valving/options.
### Integrated Hydrostatic Transmission

#### HTE Series

**Shaft Output Torque Ratings (per transmission)**

<table>
<thead>
<tr>
<th>Motor Displacement (cc/rev)</th>
<th>130</th>
<th>165</th>
<th>195</th>
<th>228</th>
<th>260</th>
<th>293</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous (lb in)</td>
<td>1580</td>
<td>1980</td>
<td>2415</td>
<td>2710</td>
<td>3140</td>
<td>3560</td>
</tr>
<tr>
<td>Minimum starting (lb in)</td>
<td>2420</td>
<td>2990</td>
<td>3635</td>
<td>3635</td>
<td>3975</td>
<td>3940</td>
</tr>
<tr>
<td>Maximum (lb in)</td>
<td>3115</td>
<td>3845</td>
<td>4675</td>
<td>4555</td>
<td>4870</td>
<td>5180</td>
</tr>
</tbody>
</table>

**Shaft Output Speed Ratings (at 3600 rpm input speed / no-load condition)**

<table>
<thead>
<tr>
<th>Motor Displacement (cc/rev)</th>
<th>130</th>
<th>165</th>
<th>195</th>
<th>228</th>
<th>260</th>
<th>293</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Speed (rpm)</td>
<td>265</td>
<td>212</td>
<td>177</td>
<td>152</td>
<td>133</td>
<td>118</td>
</tr>
<tr>
<td>Speed (mph) 18&quot; Tire</td>
<td>13.4</td>
<td>10.7</td>
<td>8.9</td>
<td>7.7</td>
<td>6.7</td>
<td>6</td>
</tr>
<tr>
<td>Speed (mph) 20&quot; Tire</td>
<td>15</td>
<td>12</td>
<td>10</td>
<td>8.6</td>
<td>7.5</td>
<td>6.7</td>
</tr>
<tr>
<td>Speed (mph) 22&quot; Tire</td>
<td>16.6</td>
<td>13.3</td>
<td>11.1</td>
<td>9.5</td>
<td>8.3</td>
<td>7.4</td>
</tr>
<tr>
<td>Speed (mph) 24&quot; Tire</td>
<td>18.1</td>
<td>14.5</td>
<td>12.1</td>
<td>10.4</td>
<td>9.1</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Values for output speed (rpm) are theoretical at 95% volumetric efficiency.
Values for output speed (mph) use the calculated speed (rpm) values and assume a rolling radius of 0.5 inches less than one-half of the tire diameter.

**Vehicle Ratings**

For use with tires up to 24" diameter and gross vehicle weights (GVW) up to 1300 lb. See side load chart on page 11 for specific side load ratings.

**Brake holding torque capacity = 4000 lb-in per side**

**Transmission weight = 30 lb**
Radial Load

The dynamic side load curves are based on uni-directional steady state loads for $L_{10}$ bearing life at stated number of revolutions. The maximum load curve is defined by bearing static load capacity. This curve should not be exceeded at any time including shock loads.

Equation to Calculate the Expected Radial Bearing Life

Equation to calculate the dynamic bearing life for a given load:

Use $F_a$, $F_b$ and $S$ in equation to determine hours of $L_{10}$ bearing life.

$$L = \frac{3 \times 10^6}{60 \times S} \left\{ \frac{F_a}{F_b} \right\}^{3.33}$$

Where:

- $S = \text{Shaft Speed RPM}$
- $L = \text{Life In Hours}$
- $F_a = \text{Dynamic side load defined by the 3 million revolutions curve at a distance from mounting flange.}$
- $F_b = \text{Application side load.}$

Note: Calculations are based on $L_{10}$ bearing life per ISO 281.
5-Bolt Hub

- HTE shown with:
  - 5-bolt hub
  - 7° fan
  - 5" pulley
  - Return-to-neutral mechanism

English equivalents for metric specifications are shown in ( ).
4-Bolt Hub

- HTE shown with:
  - 4-bolt hub
  - 6" fan
  - 4" pulley
  - Control arm / no return-to-neutral mechanism

English equivalents for metric specifications are shown in ( ).
Page intentionally left blank
HTJ Series Integrated
Hydrostatic Transmission

Features
- Integrated pump/motor assembly
- Integral charge pump – 2.1 cc/rev
- Easy-to-service filter
- No expansion tank required
- Fan and pulley included
  - 5" pulley standard
  - 4" optional
  - 7" fan standard
  - 6" optional with 4" pulley
- Integral reservoir (approx 0.5 gal)
- Parking brake optional
- Easy fluid change
- Return-to-neutral options
- Integral shock valves optional

Pump

<table>
<thead>
<tr>
<th>cc/rev</th>
<th>10.2</th>
</tr>
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<tbody>
<tr>
<td>cu in/rev</td>
<td>0.623</td>
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</tbody>
</table>

Motors

<table>
<thead>
<tr>
<th>cc/rev</th>
<th>130</th>
<th>163</th>
<th>195</th>
<th>228</th>
<th>260</th>
<th>293</th>
</tr>
</thead>
<tbody>
<tr>
<td>cu in/rev</td>
<td>8.0</td>
<td>10.0</td>
<td>11.9</td>
<td>13.9</td>
<td>15.9</td>
<td>17.9</td>
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</tbody>
</table>
Integrated Hydrostatic Transmission
HTJ Series

HTJ Series

Pump Displacement

XX

Orientation

X

Motor Displacement

XXX

Control Arm

X

<table>
<thead>
<tr>
<th>Code</th>
<th>cm³/rev</th>
<th>in³/rev</th>
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</thead>
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</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>cm³/rev</th>
<th>in³/rev</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>130</td>
<td>8.0</td>
</tr>
<tr>
<td>165</td>
<td>163</td>
<td>10.0</td>
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<tr>
<td>195</td>
<td>195</td>
<td>11.9</td>
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<tr>
<td>230</td>
<td>228</td>
<td>13.9</td>
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<td>260</td>
<td>260</td>
<td>15.9</td>
</tr>
<tr>
<td>295</td>
<td>293</td>
<td>17.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Control Arm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No return-to-neutral (RTN)</td>
</tr>
<tr>
<td>B</td>
<td>RTN heavy spring / heavy spring</td>
</tr>
<tr>
<td>C</td>
<td>Control lever only</td>
</tr>
</tbody>
</table>
### Shock Valves & Orifices

**Code** | **Option**
--- | ---
AAAB | Unpainted — Motor subassembly painted, other surfaces left unpainted.

**Code** | **Brake Lever**
--- | ---
0 | No brake
A | Drum Brake - two hole lever
B | Drum Brake - one-hole lever

**Code** | **Wheel Hub**
--- | ---
0 | 1-1/4" tapered output shaft
4 | 4-bolt hub
5 | 5-bolt hub

**Code** | **Forward**
--- | ---
N | Shock Valve - no orifice
M | Shock Valve - .018" orifice
L | Shock Valve - .024" orifice
K | Shock Valve - .031" orifice
J | Check Valve - no orifice
H | Check Valve - .018" orifice
G | Check Valve - .024" orifice
F | Check Valve - .031" orifice
E | Check Valve - .044" orifice

**Code** | **Option**
--- | ---
M | Shock Valve - .018" orifice
L | Shock Valve - .024" orifice
K | Shock Valve - .031" orifice
H | Check Valve - .018" orifice
G | Check Valve - .024" orifice
F | Check Valve - .031" orifice
E | Check Valve - .044" orifice

*Consult factory for other available shafts/valving/options.*
Shaft Output Torque Ratings (per transmission)

<table>
<thead>
<tr>
<th>Motor Displacement (cc/rev)</th>
<th>130</th>
<th>165</th>
<th>195</th>
<th>228</th>
<th>260</th>
<th>293</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous (lb in)</td>
<td>1580</td>
<td>1980</td>
<td>2415</td>
<td>2710</td>
<td>3140</td>
<td>3560</td>
</tr>
<tr>
<td>Minimum starting (lb in)</td>
<td>2420</td>
<td>2990</td>
<td>3635</td>
<td>3975</td>
<td>3940</td>
<td></td>
</tr>
<tr>
<td>Maximum (lb in)</td>
<td>3115</td>
<td>3845</td>
<td>4675</td>
<td>4870</td>
<td>5180</td>
<td></td>
</tr>
</tbody>
</table>

Shaft Output Speed Ratings (at 3600 rpm input speed / no-load condition)

<table>
<thead>
<tr>
<th>Motor Displacement (cc/rev)</th>
<th>130</th>
<th>165</th>
<th>195</th>
<th>228</th>
<th>260</th>
<th>293</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Speed (rpm)</td>
<td>265</td>
<td>212</td>
<td>177</td>
<td>152</td>
<td>133</td>
<td>118</td>
</tr>
<tr>
<td>Speed (mph) 18&quot; Tire</td>
<td>13.4</td>
<td>10.7</td>
<td>8.9</td>
<td>7.7</td>
<td>6.7</td>
<td>6</td>
</tr>
<tr>
<td>Speed (mph) 20&quot; Tire</td>
<td>15</td>
<td>12</td>
<td>10</td>
<td>8.6</td>
<td>7.5</td>
<td>6.7</td>
</tr>
<tr>
<td>Speed (mph) 22&quot; Tire</td>
<td>16.6</td>
<td>13.3</td>
<td>11.1</td>
<td>9.5</td>
<td>8.3</td>
<td>7.4</td>
</tr>
<tr>
<td>Speed (mph) 24&quot; Tire</td>
<td>18.1</td>
<td>14.5</td>
<td>12.1</td>
<td>10.4</td>
<td>9.1</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Values for output speed (rpm) are theoretical at 95% volumetric efficiency. Values for output speed (mph) use the calculated speed (rpm) values and assume a rolling radius of 0.5 inches less than one-half of the tire diameter.

Vehicle Ratings

For use with tires up to 24" diameter and gross vehicle weights (GVW) up to 1600 lb. See side load chart on page 19 for specific side load ratings.

Brake holding torque capacity = 4000 lb-in per side
Transmission weight = 32 lb
Radial Load

The dynamic side load curves are based on uni-directional steady state loads for L₁₀ bearing life at stated number of revolutions. The maximum load curve is defined by bearing static load capacity. This curve should not be exceeded at any time including shock loads.

Equation to Calculate the Expected Radial Bearing Life

Equation to calculate the dynamic bearing life for a given load:

Use $F_a$, $F_b$, and $S$ in equation to determine hours of $L_{10}$ bearing life.

$$L = \frac{3 \times 10^6}{60 \times S} \left\{ \frac{F_a}{F_b} \right\}^{3.33}$$

Where:

- $S$ = Shaft Speed RPM
- $L$ = Life In Hours
- $F_a$ = Dynamic side load defined by the 3 million revolutions curve at a distance from mounting flange.
- $F_b$ = Application side load.

Note: Calculations are based on $L_{10}$ bearing life per ISO 281.
5-Bolt Hub

- HTJ shown with:
  - 5-bolt hub
  - 7" fan
  - 5" pulley
  - Return-to-neutral mechanism

<table>
<thead>
<tr>
<th>MOTOR DISPLACEMENT</th>
<th>DIM &quot;A&quot;</th>
<th>DIM &quot;B&quot;</th>
<th>DIM &quot;C&quot;</th>
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</thead>
<tbody>
<tr>
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<td>4.99</td>
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<td>139.4</td>
<td>5.48</td>
<td>10.45</td>
</tr>
</tbody>
</table>

English equivalents for metric specifications are shown in ( ).
4-Bolt Hub

- HTJ shown with:
  - 4-bolt hub
  - 6" fan
  - 4" pulley
  - Control arm / no return-to-neutral mechanism

English equivalents for metric specifications are shown in ( ).
Page intentionally left blank
HTG Series Integrated Hydrostatic Transmission

Features
- Integrated pump/motor assembly
- Integral charge pump – 2.1 cc/rev
- Easy-to-service filter
- Remote expansion tank required
- Fan and pulley included
  - 6” pulley standard
  - 5” optional with 14cc pump
  - 8.3” fan standard
- Integral reservoir (approx 0.8 gal)
- Parking brake optional
- Easy fluid change
- Return-to-neutral options
- Integral shock valves standard

Schematic Symbol

<table>
<thead>
<tr>
<th>Pump</th>
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<tbody>
<tr>
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Integrated Hydrostatic Transmission
HTG Series

HTG Series
XX
Pump Displacement
X
Orientation
XXX
Motor Displacement
X
Control Arm

<table>
<thead>
<tr>
<th>Code</th>
<th>cm³/rev</th>
<th>in³/rev</th>
</tr>
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<tbody>
<tr>
<td>14</td>
<td>14.1</td>
<td>.854</td>
</tr>
<tr>
<td>16</td>
<td>16.0</td>
<td>.976</td>
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Orientation
L Left side transmission
R Right side transmission

<table>
<thead>
<tr>
<th>Code</th>
<th>cm³/rev</th>
<th>in³/rev</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>280</td>
<td>280</td>
<td>17.1</td>
</tr>
<tr>
<td>310</td>
<td>310</td>
<td>18.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Control Arm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No return-to-neutral (RTN)</td>
</tr>
<tr>
<td>B</td>
<td>RTN heavy spring / heavy spring</td>
</tr>
<tr>
<td>C</td>
<td>Control lever only</td>
</tr>
</tbody>
</table>
**Ordering Information**

**Integrated Hydrostatic Transmission**

**HTG Series**

**Shock Valves & Orifices**

**Wheel Hub**
0 1-1/4" tapered output shaft
4 4-bolt hub
5 5-bolt hub

**Brake Lever**
0 No brake
A Drum Brake - two hole lever
B Drum Brake - one-hole lever

**Forward**

**Reverse**

**Option**

**Code** | **Option**
---|---
AAAB | Unpainted — Motor subassembly painted, other surfaces left unpainted.

**Code** | **Option**
---|---
U | Shock valve - no orifice
T | Shock valve - .018" orifice
S | Shock valve - .024" orifice
R | Shock valve - .031" orifice
P | Shock valve - .044" orifice

**Code** | **Option**
---|---
U | Shock valve - no orifice
T | Shock valve - .018" orifice
S | Shock valve - .024" orifice
R | Shock valve - .031" orifice
P | Shock valve - .044" orifice

*Consult factory for other available shafts/valving/options.*
### Ratings Table

#### Shaft Output Torque Ratings (per transmission)

<table>
<thead>
<tr>
<th>Motor Displacement (cc/rev)</th>
<th>240</th>
<th>280</th>
<th>310</th>
<th>240</th>
<th>280</th>
<th>310</th>
<th>240</th>
<th>280</th>
<th>310</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Displacement (cc/rev)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>14</td>
<td>3090</td>
<td>3590</td>
<td>4250</td>
<td>5150</td>
<td>5970</td>
<td>6880</td>
<td>5990</td>
<td>7040</td>
<td>8180</td>
</tr>
<tr>
<td>16</td>
<td>2680</td>
<td>3110</td>
<td>3680</td>
<td>5150</td>
<td>5970</td>
<td>6880</td>
<td>5990</td>
<td>7040</td>
<td>8180</td>
</tr>
</tbody>
</table>

#### Shaft Output Speed Ratings (at 3600 rpm input speed / no-load condition)

<table>
<thead>
<tr>
<th>Motor Displacement (cc/rev)</th>
<th>240</th>
<th>280</th>
<th>310</th>
<th>240</th>
<th>280</th>
<th>310</th>
<th>240</th>
<th>280</th>
<th>310</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Displacement (cc/rev)</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>200</td>
<td>171</td>
<td>154</td>
<td>13.1</td>
<td>11.2</td>
<td>10.1</td>
<td>13.7</td>
<td>11.7</td>
<td>10.6</td>
</tr>
<tr>
<td>16</td>
<td>228</td>
<td>195</td>
<td>177</td>
<td>14.9</td>
<td>12.8</td>
<td>11.6</td>
<td>15.6</td>
<td>13.4</td>
<td>12.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor Displacement (cc/rev)</th>
<th>240</th>
<th>280</th>
<th>310</th>
<th>240</th>
<th>280</th>
<th>310</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Displacement (cc/rev)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>—</td>
<td>12.2</td>
<td>11.0</td>
<td>—</td>
<td>—</td>
<td>11.5</td>
</tr>
<tr>
<td>16</td>
<td>—</td>
<td>14.0</td>
<td>12.6</td>
<td>—</td>
<td>—</td>
<td>13.1</td>
</tr>
</tbody>
</table>

Values for output speed (rpm) are theoretical at 95% volumetric efficiency using nominal displacement values.

Values for output speed (mph) use the calculated speed (rpm) values and assume a rolling radius of 0.5 inches less than one-half of the tire diameter.

#### Vehicle Ratings

For use with tires up to 26" diameter and gross vehicle weights (GVW) up to 2500 lb. See side load chart on page 27 for specific side load ratings.

**Brake holding torque capacity = 4000 lb-in per side**

**Transmission weight = 66 lb**
Equation to Calculate the Expected Radial Bearing Life

Equation to calculate the dynamic bearing life for a given load:

Use \( F_a \), \( F_b \) and \( S \) in equation to determine hours of \( L_{10} \) bearing life.

\[
L = \frac{3 \times 10^6}{60 \times S} \left\{ \frac{F_a}{F_b} \right\}^{3.33}
\]

Where:
- \( S \) = Shaft Speed RPM
- \( L \) = Life In Hours
- \( F_a \) = Dynamic side load defined by the 3 million revolutions curve at a distance from mounting flange.
- \( F_b \) = Application side load.

Note: Calculations are based on \( L_{10} \) bearing life per ISO 281.
5-Bolt Hub

- HTG shown with:
  - 5-bolt hub
  - 6” pulley
  - Two-hole brake lever
  - Control arm / no return-to-neutral mechanism

English equivalents for metric specifications are shown in ( ).
HTG shown with:
- 4-bolt hub
- 5” pulley
- Single-hole brake lever “sized to fit through pilot diameter”
- Return-to-neutral mechanism

English equivalents for metric specifications are shown in ( ).
Fluid

Each unit is pre-filled from the factory. Top off expansion tanks (HTG only) with a premium grade hydraulic or engine oil. Fluids with a minimum of .125% zinc (or equivalent) anti-wear package should be used. A mineral or synthetic based 10W40 engine oil or hydraulic fluid is recommended.

Recommended fluids are:
- Castrol Syntec 5w-50
- Amsoil AW ISO 68
- Shell TTF-SB

Hydraulic Fluid and Filter Service Intervals

HTE Transmissions:
The HTE transmission is intended to be sealed throughout the warranty life of 750 hours.

HTJ Transmissions:
The hydraulic oil and filter should be changed at 200 - 300 hours of use. If one of the recommended fluids above are used, change the oil and filter at 500 hour intervals thereafter. If other fluids are used, change the oil and filter at 250 hour intervals thereafter.

HTG Transmissions:
The hydraulic oil and filter should be changed at 200 - 300 hours of use. If one of the recommended fluids above are used, change the oil and filter at 500 hour intervals thereafter. If other fluids are used, change the oil and filter at 250 hour intervals thereafter.

Shock Valves

Shock valves limit the circuit pressure to prevent internal damage from pressure spikes. These are not “full-flow” relief valves. Continuous operation at the shock valve pressures will cause overheating and internal damage.

Control Orifices

Shock valve orifices affect transmission responsiveness. Larger orifices allow for smoother operation, while smaller orifices offer greater responsiveness for the skilled operator.

Wheel Lug Nut Torque

Recommended torque for the lug nuts mounting the wheel to the brake drum is 65 – 75 ft lb

CAUTION! Static Brake Only

The parking brakes are designed for static use only, i.e., the brake should not be used to stop the vehicle and the vehicle should not be started while the brake is applied. Using the brake in a dynamic condition (while the vehicle is moving) will damage and reduce the holding capacity of the brake. If the brake does not hold because it has been damaged, personal injury or property damage could result.

Brake Holding Capacity and Periodic Test

The brake holding capacity rating is based on actual holding capacity when new. If properly used as a static brake only, the holding capacity will slowly decrease with time. Since holding capacity will slowly decrease over time, a proper maintenance procedure should include periodically testing the holding capacity of the brake. This can be achieved by running a vehicle ramp test per OEM instructions.
11. Buyer's Obligation; Rights of Seller. To secure payment of all sums due or other- 
wise, Buyer shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer au-
thorizes Seller to file as its attorney in fact any financing statements on Buyer's documents Seller deems necessary to perfect its security interest. Seller shall have a security interest in, and lien upon, any property of Buyer in Seller's possession as security for the payment of amounts due under this agreement. Seller is authorized to assign all documents owed to Seller by Buyer in accordance with the terms and conditions of this agreement.

12. Improper Use and Indemnity. Buyer shall indemnify, defend, and hold Seller harm-
less from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringe-
ment or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

13. Cancellations and Changes. Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend, and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any charges incurred by Seller due to Buyer's changes in shipping, purchase specifications or in accordance with Section 13, herein.

14. Limitation on Assignment. Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

15. Entire Agreement. This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of the agreement. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

16. Waiver and Severability. Failure to enforce any provision of this agreement will not waive that provision or allow any such failure prejudice Seller's right to enforce that pro-
vision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

17. Termination. This agreement may be terminated by Seller for any reason and at any time by giving Buyer thirty (30) days written notice of termination. In addition, Seller may by written notice immediately terminate this agreement for the following: (a) Buyer commits a breach of any provision of this agreement (b) the appointment of a trustee, receiver or custodian for all or any part of Buyer's property (c) (the filing of a petition for relief in bankruptcy of the other Party on its own behalf, or by a third party (d) an assign-
ment for the benefit of creditors, or (e) the dissolution or liquidation of the Buyer.

18. Governing Law. This agreement and the sale and delivery of all Products here-
under shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts situated in Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement. Disputes between the parties shall not be settled by arbitration unless, after a dispute has arisen, both parties expressly agree in writing to have the dispute arbitrated.

19. Indemnity for Infringement of Intellectual Property Rights. Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights as except as provided in this Section, Seller will defend and in-
dependently Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party, Seller, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Prod-
cut so as to make it noninfringing, or offer to accept return of the Product for the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs, drawings and/or specifications have been supplied to Buyer for the purpose of combination or use in a system of any Product sold hereunder. The foregoing provi-
sions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

20. Taxes. Unless otherwise indicated, all prices and charges are exclusive of excise,
tax, sales tax, value added tax, any such specially converted for such manufacture or assembly, taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of Products.

21. Equal Opportunity Clause. For the performance of government contracts and where dollar value of the Products exceeds $10,000, the equal employment opportunity provisions of Executive Order 11246, VEVRAA, and 41 C.F.R. §§ 60-1.4(a), 60-741.5(a), and 60-250.4, are hereby incorporated.

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Greeneville, Tennessee
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