Adjustable Pitch Fan Assembly
11’ through 20’ Diameter

*Hudson Tuf-Lite III® fan blades*

Hudson Tuf-Lite III® Ultra Hi Temp (Burnt Orange) fan blades are of single piece fiberglass reinforced plastic (FRP) construction optimized for performance, reliability, noise, and cost effectiveness. Tuf-Lite III® fan blades are constructed of lightweight, corrosion-resistant, fiberglass reinforced vinyl-ester resin, with materials, thickness, and processes determined from finite element analysis modeling. Tuf-Edge® leading edge erosion and UV protection is a standard with this blade.

The individually balanced blades can be replaced independently - matched sets are not required.
RECOMMENDED TOOLS

- Long T-Handle Allen Wrench Set (3/16" to 3/8")
- Medium Size Flat Head Screw Driver
- Brass Ball Peen Hammer
- Flat Bastard File
- 240 Grit Sand Paper
- Anti-Seize Lubricant
- WD-40
- 12" Crescent Wrench
- Shop Towels
- Exact-A-Pitch® Digital Protractor (P/N 62375)
- 25 ft. Measuring Tape
- Pencil or Marker
- Open/Box End Wrench Set (1/2" - 1-1/2")
- Socket Set for 1/2" Drive (1/2" - 1-1/2")
- Torque Wrench(s) Rated for 0-200 ft-lb

INSTALLATION PROCEDURES

ASSEMBLY WITH BUSHING

Clean all mating surfaces between hub, bushing and shaft. All grease and lubricant should be removed, leaving the mating surfaces dry.

If there is no shoulder on shaft to prevent bushing from sliding down shaft, slide spacer/sleeve (not provided) on shaft before bushing or use a thrust retainer (optional equipment) on top of hub. Slide bushing and key onto shaft until flush with end of shaft. The shaft size determines the bushing type (Q2, R2, or S2). Lock bushing on shaft by tightening the set screw in flange with an Allen Wrench. (Note: Q2 bushings have no set screws.) Line up key and set hub on bushing. Engage the three (3) cap screws in flange of bushing into hub spool, using a torque wrench with a socket, and tighten evenly. Use the following table to determine the proper tools and torque values.

### ASSEMBLY WITH STRAIGHT SHAFT (NO BUSHING)

Clean all mating surfaces between the hub and the shaft. If there is no shoulder on shaft to prevent hub from sliding down shaft, slide spacer/sleeve (not provided) on shaft before hub or use a thrust retainer (optional equipment) on top of hub. Install key in shaft. Line up key and keyway and set hub on shaft. Tighten set screw(s) in hub.

### ASSEMBLY WITH TAPERED SHAFT (NO BUSHING REQUIRED)

Clean all mating surfaces between the hub and shaft. Coat all mating surfaces with an anti-seize or lubricating compound. Align keyways and install hub. Install retainer plate and cap screw(s) with lock washer(s). Shaft size determines what size cap screw is necessary. Using a torque wrench with a socket, evenly tighten cap screw to recommended standard per table below.

#### ASSEMBLY WITH STRAIGHT SHAFT (NO BUSHING)

<table>
<thead>
<tr>
<th>Bushing Size</th>
<th>Allen Wrench Size</th>
<th>Cap Screw Size</th>
<th>Socket Size</th>
<th>Torque (ft-lb) Dry</th>
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<tbody>
<tr>
<td>Q2</td>
<td>-</td>
<td>3/8&quot;</td>
<td>9/16&quot;</td>
<td>29</td>
</tr>
<tr>
<td>R2</td>
<td>3/16&quot;</td>
<td>3/8&quot;</td>
<td>9/16&quot;</td>
<td>29</td>
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<tr>
<td>S2</td>
<td>3/16&quot;</td>
<td>1/2&quot;</td>
<td>3/4&quot;</td>
<td>70</td>
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#### ASSEMBLY WITH TAPERED SHAFT (NO BUSHING REQUIRED)

<table>
<thead>
<tr>
<th>Cap Screw Size</th>
<th>Socket Size</th>
<th>Torque Value (ft-lb)</th>
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</thead>
<tbody>
<tr>
<td>5/8&quot; NC</td>
<td>15/16&quot;</td>
<td>80 90</td>
</tr>
<tr>
<td>3/4&quot; NC</td>
<td>1-1/8&quot;</td>
<td>120 130</td>
</tr>
<tr>
<td>1&quot; NC</td>
<td>1-1/2&quot;</td>
<td>150 160</td>
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</table>

NOTE: Retaining arrangement varies with gear shaft design.
SEAL DISC HARDWARE INSTALLATION

*Seal disc mounting hardware must be installed BEFORE installing blades and blade clamps, due to limited working space.

For 4 to 9 Blades:

Install seal disc spacer as shown in Figures 1 and 2. Install 3/8” bolts on the top hub plate with the threaded portion pointing upwards. Place spacer on bolt, then flat washer, and then tighten 3/8” NC nut to recommended standard of 15 ft-lb (lubricated) or 20 ft-lb (dry).

For 10 to 12 Blades:

Install 3/8” NC bolts at six (6) places on top hub plate as shown in Figure 3. Threaded portion of bolts must be pointing up to mount seal disc. Install nut on each bolt. Tighten 3/8” NC nuts to 15 ft-lb (lubricated) and 20 ft-lb (dry).

NOTE: Three belleville spring washers should be cupped upward and stacked in the same direction as shown on Figure 5A.

BLADE INSTALLATION

To prevent installation problems, work on one blade at a time. Remove blade clamp bolts, nuts, lock washers, and blade clamp halves from hub. Discard the plastic shipping spacers between the upper and lower blade clamp halves. Assemble blade clamp halves over groove in blade neck, and install into hub (See Figure 4). The thick leading edge will be to your left and thin trailing edge will be to your right as you stand at end of blade.
SET PITCH AND TRACK

Use Hudson's EXACT-A-PITCH® digital protractor (See Figure 6) or a bubble protractor to set blade pitch. Mount protractor on a flat bar as a base and place it approximately 1" from tip of blade. Note pitch on protractor. Rotate fan 360°, noting high and low pitch readings. Locate place where pitch reading is at mid-point between high and low readings, and set pitch at that point.

Figure 5

Use torque wrench to tighten clamp bolts to 150 ft-lb (lubricated) or 200 ft-lb (dry). Re-check pitch setting. Blade must be set within +/-0.2° of desired pitch angle. Tighten clamp bolts evenly. DO NOT OVER-TORQUE CLAMP BOLTS.

When bolts are tightened, hold a pencil against top end of blade and mark the level onto a fixed object, such as a pole or the fan ring.

Install remaining blades at same place as first blade, following the instructions above. After tightening bolts, mark top end of each blade in same place first blade was marked. If marks differ by more than 3/4", adjust blade.

CHECK TRACK

After fan is installed in fan stack cylinder ring, outline top side of each blade onto fan stack cylinder ring with a marker (See Figure 7). The difference between levels of highest and lowest outlines should not be more than 3/4". Correct blade track by loosening clamp bolts and adjusting blade to match track of other blades. Retighten bolts and re-check track and pitch angle setting. Re-tighten blade clamp bolts to recommended standard torque.

Figure 6

CHECK SWEEP

Measure the distance from trailing edge at blade tip of one blade to trailing edge at blade tip of the adjacent blade (See Figure 7A). This distance should be within 3/4" of each other for all successive blades. Correct blade sweep by loosening clamp bolts and adjusting blade to match sweep of other blades. Re-tighten bolts and re-check sweep and pitch angle setting. Re-tighten blade clamp bolts to recommended standard of 150 ft-lb (lubricated) or 200 ft-lb (dry) torque.

Figure 7
SEAL DISC INSTALLATION

For all blade counts:

After installing blades, seal disc should be installed on the previously installed seal disc hardware as shown in Figure 8 for 4 to 9 bladed hubs, or Figure 9 for 10 to 12 bladed hubs. Install flat washer, then place seal disc on top. Install another flat washer, lock washer, and nut on top. Tighten 3/8” NC nut to recommended standard of 15 ft-lb (lubricated) or 20 ft-lb (dry). If difficulty is encountered, loosen bolts on seal flanges until seal disc can be mounted, then re-tighten.

NOTE: The purpose of the seal disc is to prevent hot air from recirculating back down through the hub, increasing efficiency.

CHECKING TIP CLEARANCE

Rotate fan in position inside fan ring or fan stack to check tip clearance (See Figure 10). The recommended tip clearance is between 3/8” and 3/4”. Check for spots where fan blade clearance is not within the recommended tolerance.

If necessary adjust fan ring or fan stack by shimming to obtain proper clearance. For heat exchangers, spacers may be added at the fan ring joints to increase clearance (See Figure 11). Use a chisel to maintain the correct gap until the bolts on the ring are re-tightened.
If a small adjustment is needed, tighten or loosen nut on fan strut in section requiring adjustment (See Figure 12).

**OPERATING INSTRUCTIONS**

Start fan and check rotation. Viewed from top (discharge), fan blades should rotate clockwise.

Hudson recommends to re-verify the blade clamp torque after the initial 10-15 minutes of cold operation (i.e., the fan doesn’t need to be exposed to the working temperature of the process). This will ensure that the blades are settled within the clamps after the centrifugal forces have acted.

Check motor power consumption to be sure fan is pulling desired load. **CAUTION: If positive pitch is set in summer to use all available motor amps (nameplate rating), motor could be overloaded in winter.** Design pitch angles usually do not use all of the available motor horsepower. This ensures that the motors will not be overloaded at low winter temperatures.

For the fans that have remained idle (such as a shutdown or turn-around), it is highly recommended to re-verify the torque on the blade clamps before putting it back into operation.

For high temperature fan applications, it is recommended to utilize upper fan bearings (See Figure 13) that are rated for high temperature exposure. Hudson can supply a high temperature bearing (Part No. 50081HT) for these specific applications.
## PART LIST

**HUDSON PRODUCTS CORPORATION**

Adjustable Pitch Fan Assembly 11' Thru 20' Diameter

4000KWUHT Series Hub

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
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<th>PART NO.</th>
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<td>Hub Plate (2 Per Hub)</td>
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<td>Tuf-Lite Ill® Ultra Hi Temp Fan Blade (Burnt Orange)</td>
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</table>
HUDSON PRODUCTS CORPORATION
Adjustable Pitch Fan Assembly 11’ Thru 20’ Diameter
Series 4000KWUHT HUB

STANDARD MATERIALS & FINISHES

Blades: Fiberglass reinforced vinyl-ester or epoxy
Hub Spool: Ductile Iron, Zinc Rich Coating
Plates: Steel, Galvanized
Bushing: Malleable Iron
Seal Disc: Fiberglass Reinforced Polyester

Blade Clamps:
Un-painted Aluminum (Standard)
Epoxy Coated Aluminum (Option 1)
Epoxy Coated Ductile Iron (Option 2)

Fasteners:
Complete Fan W/316 SS (Option 1)
Complete Fan W/K500 Monel (Option 2)

WHEN ORDERING, SPECIFY FAN DIAMETER, TYPE & NUMBER OF BLADES & SHAFT DIAMETER

EXAMPLE: APT 14KWUHT 6 2 7/8" BORE
Fan Model Adjustable Pitch Fan Diameter & Blade Type (Specify “KWUHT” for Tuf-Lite III® KW Ultra Hi Temp Blades) Number of Blades Shaft Diameter

Installation Manual 4000KWUHT
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January 2021