HUDSON
Products Corporation

Tuf-Lite III® Fans
K Ultra Hi Temp
3000KUHT Series Hub

INSTALLATION MANUAL

Adjustable Pitch Fan Assembly
6’ thru 15’ 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 light weight, 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. Slide bushing and key onto shaft until flush with end of shaft. The shaft size determines the bushing type (Q2 or R2). 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. Cap screw(s) for retainer plate are not required for bushing application.

Bushing Size	Allen Wrench Size	Cap Screw Size	Socket Size	Torque (ft-lb) Dry
Q2	-	3/8"	9/16"	29
R2	3/16"	3/8"	9/16"	29

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. 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. 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.

Cap Screw Size	Socket Size	Torque Value (ft-lb)	
		Lubricated	Dry
5/8" NC	15/16"	80	90
3/4" NC	1-1/8"	100	110
1" NC	1-1/2"	150	160

NOTE: Retaining arrangement varies with gear shaft design.

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 1). 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.

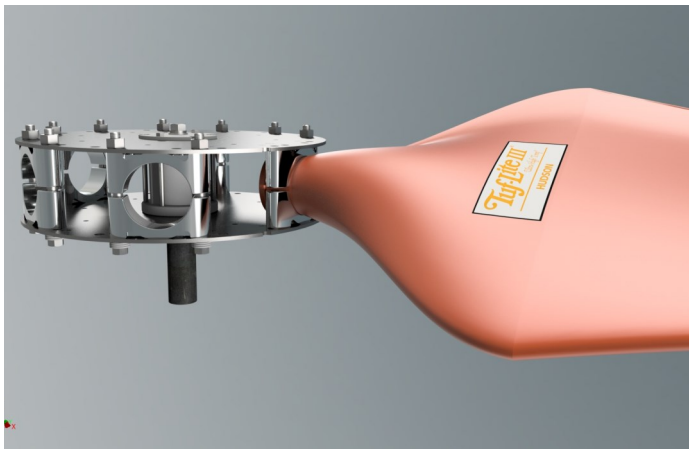


Figure 1

Install clamp bolts through hub plates and blade clamp, putting bolt heads and four belleville spring washers on bottom, and lock nuts on top (See Figure 2). Tighten lightly.
NOTE: Four belleville spring washers should be cupped upward and stacked in the same direction as shown on Figure 2A.

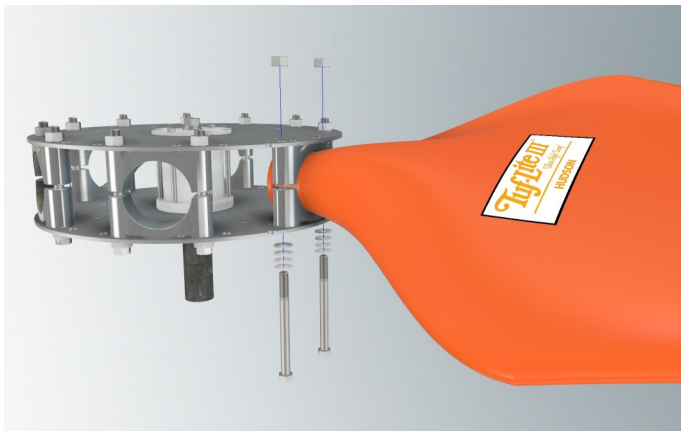


Figure 2

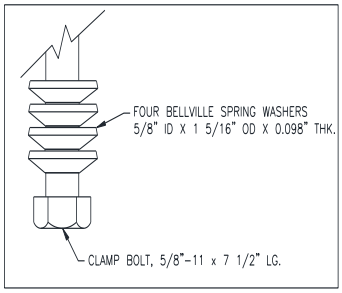


Figure 2A

SET PITCH AND TRACK

Use Hudson's EXACT-A-PITCH® digital protractor (See Figure 3) 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 3

Rotate blade in clamp until digital protractor shows specified pitch angle to within +/-0.2°. *Fan pitch angle is shown on fan specification sheet for design duty*. After desired pitch angle is set, raise and lower end of fan blade and find midpoint of blade travel. Hold blade at the midpoint. Pull blade outward so that the blade neck flange rests against the back of the blade clamps. Push blade to the right to remove all slack.

Use torque wrench to tighten clamp bolts to 100 ft-lb (lubricated) or 125 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 the same place first blade was marked. If marks differ by more than 1/2", adjust blade.

CHECK TRACK

After fan is installed in fan stack cylinder ring, outline the top side of each blade onto fan stack cylinder ring with a marker (See Figure 4). The difference between levels of highest and lowest outlines should be within ±1". Correct blade track by loosening clamp bolts and adjusting blade to match track of other blades. Re-tighten bolts and re-check track and pitch angle setting. Re-tighten blade clamp bolts to recommended standard of 100 ft-lb (lubricated) or 125 ft -lb (dry) torque.

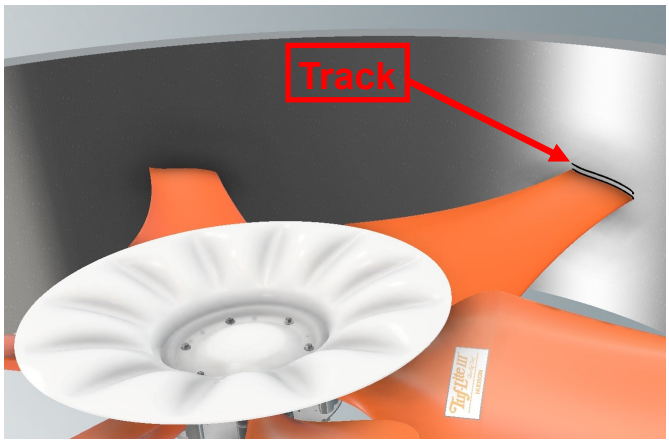


Figure 4

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 4a). This distance should be within 1/2" 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 100 ft-lb (lubricated) or 125 ft-lb (dry) torque.

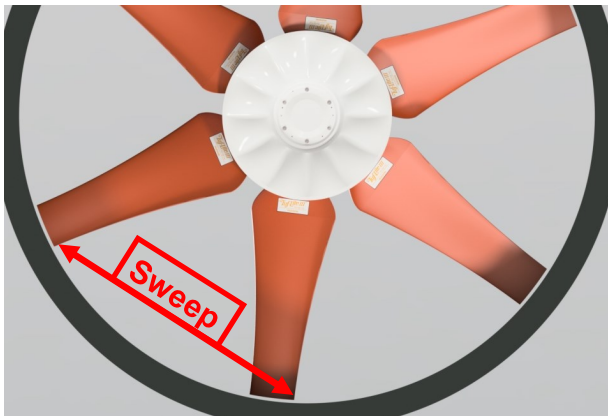


Figure 4a

SEAL DISC INSTALLATION

For 4 to 9 Blades

Fasten seal disc to top of hub with four (4) 3/8" cap screws, as shown in figures 5 and 6. Tighten to recommended standard of 15 ft-lb (lubricated) or 20 ft-lb (dry).

Figure 5

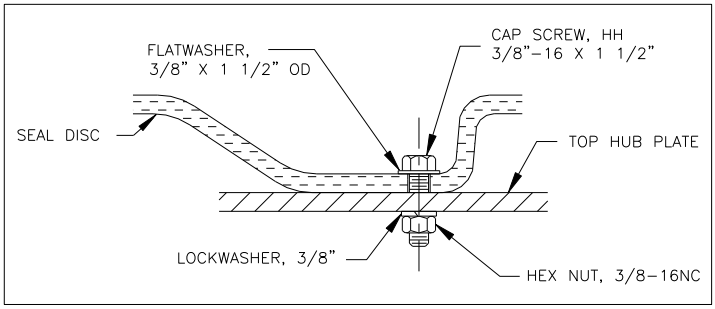


Figure 6

For 10 to 15 Blades:

Install 3/8" NC bolts at six (6) places on top hub plate (See Figure 6a & 6b). Threaded portion of bolts must be pointing up to mount seal disc. Install lock washer, nut, and flat washer on each bolt. Tighten 3/8" NC nuts to 15 ft-lb (lubricated) and 20 ft-lb (dry).

Locate the six (6) mounting holes in seal disc and install over the six (6) bolts pointing up on upper hub plate. If difficulty is encountered, loosen bolts on seal flanges until seal disc can be mounted, then re-tighten to 15 ft-lb (lubricated) or 20 ft-lb (dry).

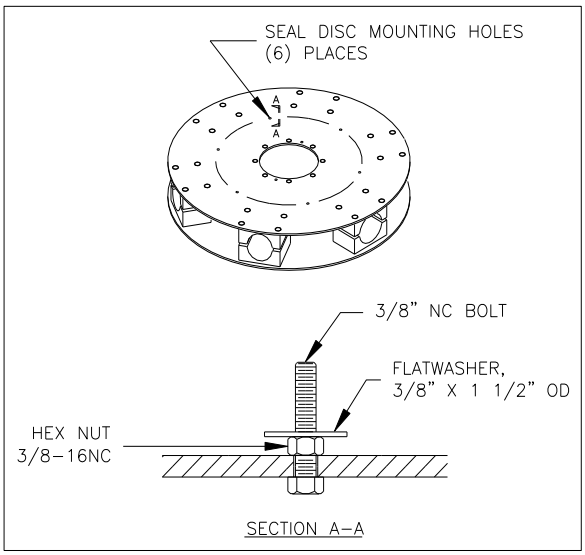


Figure 6a

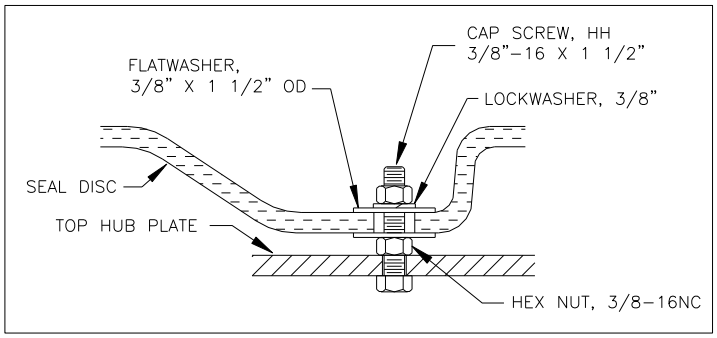


Figure 6b

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 7). The recommended tip clearance is shown in the table below. Check for spots where fan blade clearance is not within the recommended tolerance.

Fan Diameter	Minimum	Maximum
6' through 9'	1/4"	1/2"
>9' through 11'	1/4"	5/8"
12' through 15'	1/4"	3/4"

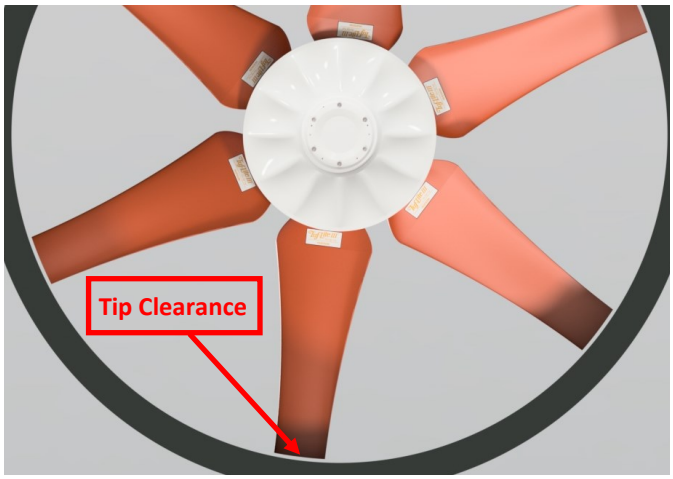


Figure 7

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 8). Use a chisel to maintain the correct gap until the bolts on the ring are re-tightened.

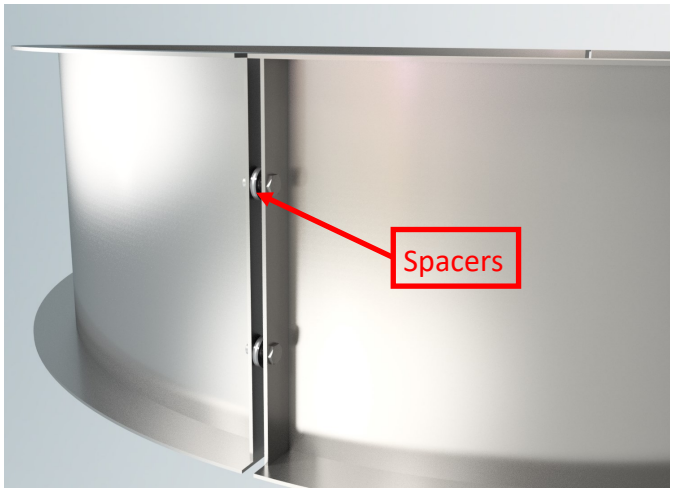


Figure 8

If a small adjustment is needed, tighten or loosen nut on fan strut in section requiring adjustment (See Figure 9).

Figure 9

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 10) that are rated for high temperature exposure. Hudson can supply a high temperature bearing (Part No. 50081HT) for these specific applications.

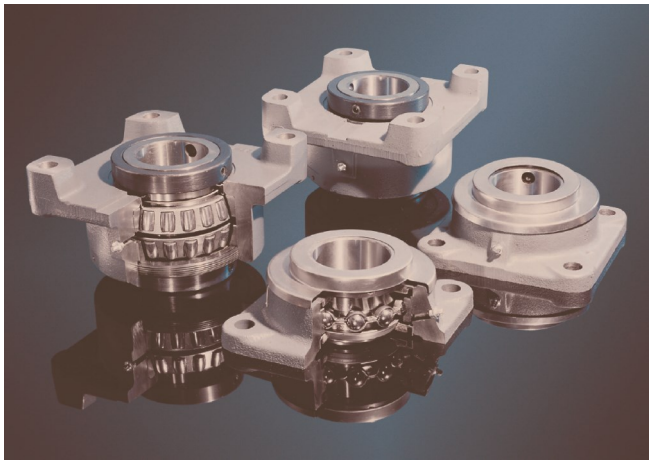
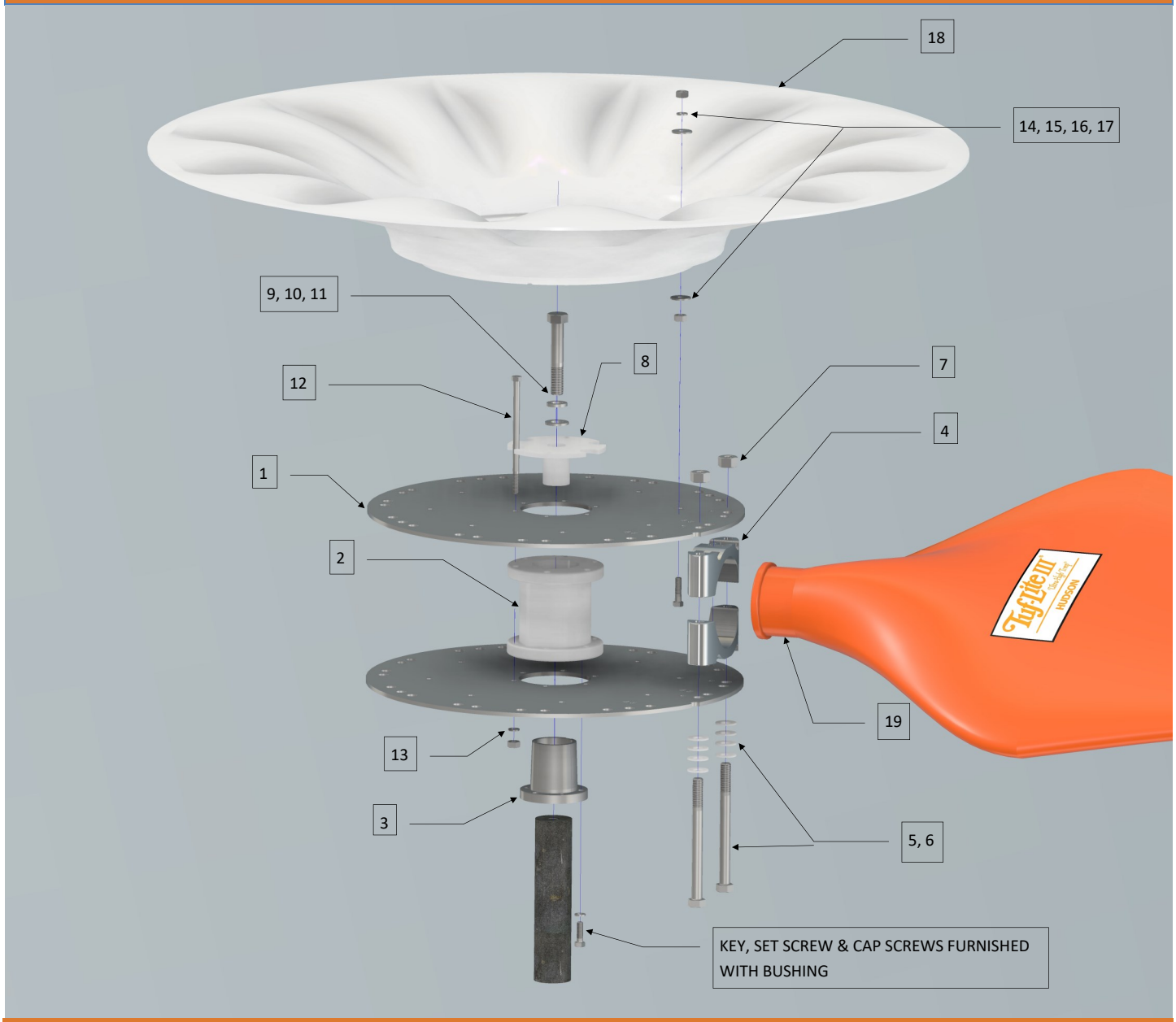


Figure 10

Parts List
HUDSON PRODUCTS CORPORATION
Adjustable Pitch Fan Assembly 6' Thru 15' Diameter
Series 3000KUHT HUB

				NO. OF BLADES											
ITEM	DESCRIPTION	TYPE	PART NO.	4	5	6	7	8	9	10	11	12	13	14	15
	1" Diameter Thru 2.62" Diameter Shaft	Q-2	6K-10K Hub Assy. No. Part No.	3104UHT H3410UHT	3105UHT H3510UHT	3106UHT H3610UHT	3107UHT H3710UHT	3108UHT H3810UHT	3109UHT H3910UHT						
			11K-14K Hub Assy. No. Part No.	3104UHT H3410UHT	3105UHT H3510UHT	3106UHT H3610UHT	3107UHT H3710UHT	3108UHT H3810UHT	3109UHT H3910UHT	3110UHT 79210UHT	3111UHT 79212UHT	3112UHT 79214UHT	3113UHT 79216UHT	3114UHT 79218UHT	3115UHT 79220UHT
			15K Hub Assy. No. Part No.	3104UHTS 79222UHT	3105UHTS 79224UHT	3106UHTS 79226UHT	3107UHTS 79228UHT	3108UHTS 79230UHT	3109UHTS 79232UHT	3110UHTS 79234UHT	3111UHTS 79236UHT	3112UHTS 79238UHT	3113UHTS 79240UHT	3114UHTS 79242UHT	3115UHTS 79244UHT
	2.68" Diameter Thru 3.62" Diameter Shaft	R-2	6K-10K Hub Assy. No. Part No.	3204UHT H3420UHT	3205UHT H3520UHT	3206UHT H3620UHT	3207UHT H3720UHT	3208UHT H3820UHT	3209UHT H3920UHT						
			11K-14K Hub Assy. No. Part No.	3204UHT H3420UHT	3205UHT H3520UHT	3206UHT H3620UHT	3207UHT H3720UHT	3208UHT H3820UHT	3209UHT H3920UHT	3210UHT 79211UHT	3211UHT 79213UHT	3212UHT 79215UHT	3213UHT 79217UHT	3214UHT 79219UHT	3215UHT 79221UHT
			15K Hub Assy. No. Part No.	3204UHTS 79223UHT	3205UHTS 79225UHT	3206UHTS 79227UHT	3207UHTS 79229UHT	3208UHTS 79231UHT	3209UHTS 79233UHT	3210UHTS 79235UHT	3211UHTS 79237UHT	3212UHTS 79239UHT	3213UHTS 79241UHT	3214UHTS 79243UHT	3215UHTS 79245UHT
1	Hub Plate (2 Per Hub)	Q-2	6K-10K Part No.	C3216	61705	C3216	61707	C3216	C3399						
		R-2		C3215	61715	C3215	61717	C3215	C3299						
		Q-2	11K-14K Part No.	C3216	61705	C3216	61707	C3216	C3399	C3410	C3411	C3412	C3413	C3414	C3415
		R-2		C3215	61715	C3215	61717	C3215	C3299	C3400	C3401	C3402	C3403	C3404	C3405
		Q-2	15K Part No.	C3578	C3580	C3582	C3584	C3578	C3579	C3580	C3581	C3582	C3583	C3584	C3585
		R-2		C3568	C3570	C3572	C3574	C3568	C3569	C3570	C3571	C3572	C3573	C3574	C3575
ITEM	DESCRIPTION	TYPE	PART NO	QUANTITY PER ASSEMBLY											
2	Hub Spool	Q-2	65101	1	1	1	1	1	1	1	1	1	1	1	1
		R-2	65102												
3	Bushing	Q-2	Specify Bore	1	1	1	1	1	1	1	1	1	1	1	1
		R-2													
4	Blade Clamp Half, Un-painted Aluminum (Standard) Option 1, Epoxy coated Aluminum Option 2, Epoxy coated Ductile Iron Option 3, Machined stainless steel		65003 65003S 65016 C3006	8	10	12	14	16	18	20	22	24	26	28	30
5	Blade Clamp Bolt 5/8"-11 x 7 1/2" (Mech. Galv.)		79326	8	10	12	14	16	18	20	22	24	26	28	30
6	Belleville Spring Washer, 5/8"ID x 1 5/16"OD x 0.098"THK,301SS		78104	32	40	48	56	64	72	80	88	96	104	112	120
7	5/8" Hex Steel Top Lock Nut, Grade C (Zinc Rich)		82734	8	10	12	14	16	18	20	22	24	26	28	30
8	Stop Plate Sub-Assembly	Q-2	65007	1	1	1	1	1	1	1	1	1	1	1	1
		R-2	65008												
9	Stop Plate Bolt 3/4"-10 x 4 1/2" (Zinc Plated)		72427	1	1	1	1	1	1	1	1	1	1	1	1
10	3/4" Lock washer (Mech. Galv.)		73738	1	1	1	1	1	1	1	1	1	1	1	1
11	3/4" Flat Washer (Mech. Galv.)		73640	1	1	1	1	1	1	1	1	1	1	1	1
12	Hub Spool Bolt 3/8"-16 x 7" with Nut (Mech. Galv.)		70700	6	6	6	6	6	6	6	6	6	6	6	6
13	3/8" Lock washer (Mech. Galv.)		73723	6	6	6	6	6	6	6	6	6	6	6	6
14	Seal Disc Bolt 3/8"-16 X 1 1/2" (316 SS)		60274	4	4	4	4	4	4	6	6	6	6	6	6
15	3/8" Flat Washer (316 SS)		73623	4	4	4	4	4	4	12	12	12	12	12	12
16	3/8" Lock washer (316 SS)		73722	4	4	4	4	4	4	6	6	6	6	6	6
17	3/8" Hex Nut (316 SS)		72050	4	4	4	4	4	4	12	12	12	12	12	12
18	38" Dia. Hi Temp Seal Disc (6K-10K with 4-9 blades)		81105HT	1	1	1	1	1	1						
	50" Dia. Hi Temp Seal Disc (11K-14K with 4-9 blades)		D3439HT	1	1	1	1	1	1						
	53" Dia. Hi Temp Seal Disc (11K-14K with 10-12 Blades)		81114HT							1	1	1			
	64" Dia. Hi Temp Seal Disc (11K-14K with 13-15 Blades and 15K with 4-15 Blades)		81115HT										1	1	1
19	Tuf-Lite III® Ultra Hi Temp Fan Blade (Burnt Orange)		Varies	4	5	6	7	8	9	10	11	12	13	14	15

HUDSON PRODUCTS CORPORATION
Adjustable Pitch Fan Assembly 6' Thru 15' Diameter
Series 3000KUHT HUB



STANDARD MATERIALS & FINISHES

Blades: Fiberglass reinforced 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)
Machined Stainless Steel (Option 3)
Fasteners:
Steel, Mech. Galvanized & 316 SS Opt.
Complete Fan with 316 SS (Option 1)
Complete Fan with K500 Monel (Option 2)

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

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

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