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Energy Recovery Wheels



Installation, Operation and Maintenance Manual

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The **Carnes Energy Recovery Wheel** is rotary air-to-air energy exchanger designed to transfer —

- a.) Sensible Energy - Series 200
- b.) Total Energy (Sensible and Latent) - Series 300

The unit consists of rotor, bearings, frame, seals, drive and optional controls. This manual describes basic installation, operation and maintenance requirements for common wheel features. Non-catalogued features may be covered by the Equipment Submittal or separate Carnes Instructions.

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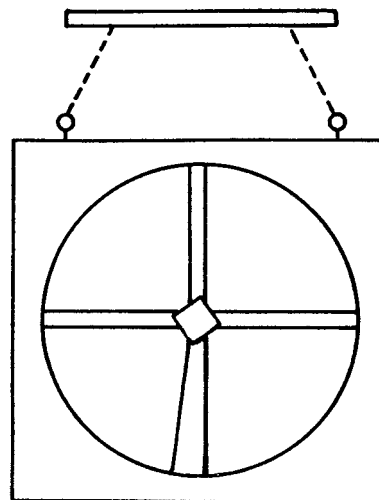
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I. RECEIPT AND STORAGE

1. The wheel must be thoroughly inspected before accepting delivery from the carrier. Inspect for:
 - a. Impact damage or serious scratches to the wheel frame.
 - b. Damage to the surface of the energy recovery wheel rotor.
2. Refer to the "Packing List" and "Wheel Shipment Checklist" (typically found on or inside the wheel frame) which details the specific hardware included and unit condition as shipped from Carnes. Any discrepancies in hardware or condition as received must be reported in writing to the carrier and Carnes Company immediately. In particular, note that:
 - a. The assembled gearmotor is rotated 90° for shipment to enclose the motor within the protective shipping wrap.
 - b. The optional rotation detector and defrost control sensors are mounted within the wheel frame.
 - c. Other optional controls (thermostats, timer, speed controller) may be packed within the wheel frame or shipped in a separate carton. Refer to the Packing List or Wheel Shipment Checklist.
3. All hoisting of the wheel must be done using the two eyebolts at the top of the unit (extended outside of shipping wrap). Wheels shipped common carrier may also be mounted on a skid suited for forklift use. Special care must be taken when handling the energy recovery wheel with a forklift to avoid tipping the unit and damaging the rotor face or wheel frame. The unit must be handled in a vertical position at all times. Damage to the rotor or frame may result if the unit is placed in a horizontal position.

DIMENSIONS LISTED IN INCHES (Millimeters)				
Wheel Size	H x W	Depth	Weight - lbs. (kg)	
			Series 200	Series 300
03	44	14	315	335
	(1118)	(356)	(143)	(152)
06	54	14	406	424
	(1372)	(356)	(184)	(192)
09	66	14	520	549
	(1676)	(356)	(236)	(249)
14	80	14	710	754
	(2032)	(356)	(322)	(342)
20	93-1/2	14	911	974
	(2375)	(356)	(413)	(442)
25	105	16	1622	1702
	(2667)	(406)	(736)	(772)
31	116	16	1878	1978
	(2946)	(406)	(852)	(897)
37	128	16	2233	2352
	(3251)	(406)	(1013)	(1067)
45	139-1/2	16	2573	2717
	(3543)	(406)	(1167)	(1232)

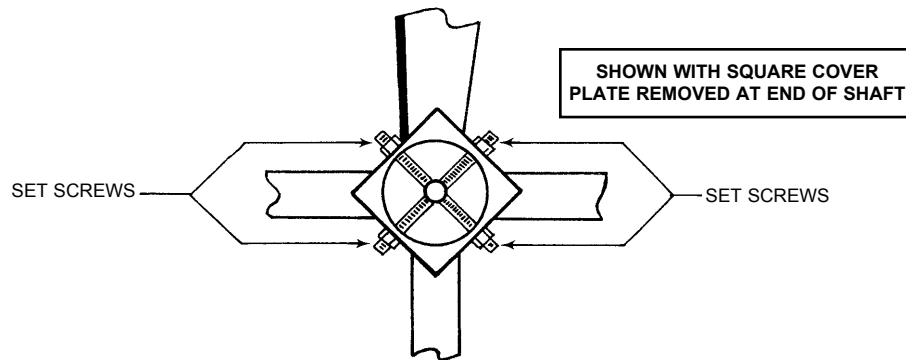


4. The protective shipping wrap is designed to protect against shipping damage and weather during shipment, not to provide a weatherproof shield for outdoor storage. If the wheel will not be installed immediately upon delivery:
 - a. Restore the shipping wrap after inspecting the condition and completeness of the delivered unit.
 - b. Protect the unit from precipitation, wind and physical damage by storing indoors or tarp-covered, fastened down and away from construction traffic.

II. PLACEMENT AND INSTALLATION

1. Remove protective shipping wrap and verify that the site duct arrangement agrees with the markings on the wheel frame. The "open" face of the wheel frame must be to the weather and the "shroud" face to the wheel frame must face the building.

2. Considering the cautions stated in I-3 on page 2, hoist the wheel for final placement. The floor, curb or rails onto which the wheels is placed must provide adequate support uniformly across the full width of the wheel frame. The wheel must be installed in a vertical plane with the frame plumb to allow proper adjustment of rotor and seals.
3. Proper installation requires provisions for access:
 - a. Through the ductwork to all faces (supply inlet and outlet, exhaust inlet and outlet) of the rotor for periodic inspection, adjustment and maintenance of the speed reduction gearbox, motor, brush seals and rotor bearings.
 - b. Remove the screw-fastened panel(s) along the side of the wheel frame enclosing the drive.
4. Remove the four foam shipping blocks wedged between the outside edge of the rotor and wheel frame.
5. If necessary, center and plumb the rotor within the wheel frame by repositioning the ends of the shaft and bolted support flanges. This is done by adjusting the four set screws gripping each end of the shaft.



6. Assemble, if necessary, the motor sheave and fasten to the slotted support base in a lower corner of the wheel frame using the rubber vibration isolators (4) under the motor, if provided. Be sure that the drive is positioned to have the sheave run perpendicular to the rotor perimeter and provide enough belt tension to avoid slippage.
7. Verify that the available power supply matches that for which the motor (speed controller) was designed. Wire the motor power supply and all associated control wiring per the applicable Carnes diagram(s):
 - a. Constant Speed Drive — # 21128.
 - b. Intermittent Timer Control — 21127.
 - c. Rotation Detector— 21124.
 - d. 2-Stat, OA Interlock — 21150.

All wiring and electrical connections must comply with the National Electric Code and local code requirements in effect. In particular, refer to Article 430 (motors, Motor Circuits and Controllers) of the NEC. A motor disconnect with thermal overload protection (such as Square D Class 2510, Type FG-6) is recommended.

8. The supply and exhaust ducts should be flanged, fastened and sealed to the outermost edge of the wheel frame on each face, as well as the divider supports running down the middle of each face of the wheel frame. The adjacent ductwork must be self-supporting and not transmit significant distortive loads to the wheel frame.

III. START-UP AND OPERATION

1. Confirm that all Placement and Installation items have been completed, particularly the removal of foam shipping wedges from between the rotor and wheel frame.
2. It is recommended to have roughing filters in both airstreams ahead of the heal wheel. When properly installed (opposite airflow directions on supply and exhaust) the rotor is self-cleaning. However, some reasonable control of airborne particulate should be considered to avoid potential wheel blockage due to accumulated dirt.

3. Verify that all switches, fuses, circuit breakers, overload relays and interlocks in the electrical system serving the drive motor are operational.
4. Energize the motor and verify correct wheel rotation direction as indicated by the arrow(s) on the shroud face of wheel frame. The wheel must rotate from exhaust to supply through the purge (pie-wedge shape portion of wheel frame). Motor rotation direction may be changed as follows:
 - a. 1 Phase AC — Rewire motor start capacitor per diagram shown on the motor nameplate or conduit box cover.
 - b. DC — Reverse the two power conductors to the motor.
 - c. 3 Phase AC — Reverse any two of the three power conductors to the motor.
5. With operating air pressures and airflows at the wheel, adjust the screw-fastened brush seals mounted on the wheel frame —
 - a. Peripheral: Perimeter of rotor, building (shroud) face.
 - b. Divider: Diameter of rotor, both sides.
 - c. Capstrip: Axial seals at two points on the outermost edge of rotor “inside” frame.

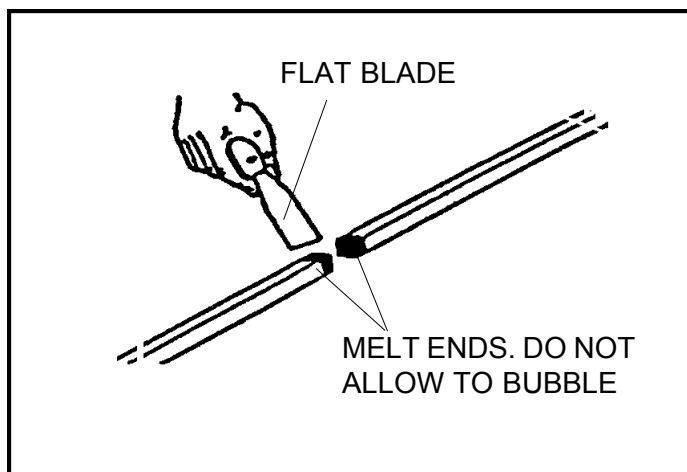
Properly adjusted seal brushes should maintain light contact with the rotor at all points of rotation, but never be compressed to more than 1/3 of the bristle length. Excessively tight seals may overload the drive motor and prematurely wear the seal bristles, whereas very loose seals may allow undesirable leakage levels. Always adjust the seals with the rotor stopped to avoid personal injury or damage to the rotor.

6. Make calibration adjustment to optional speed controllers, rotation detectors, thermostat(s), pressure switch and/or timer per the instruction on Carnes forms #21124, 21126 and 21127.
7. After 20 minutes operation with operating air pressures and airflows, measure the drive motor current and verify that it is not higher than the nameplate full load amps.
8. Series 300 rotors may have to operate 24-72 hours (with significant humidity differential between supply and exhaust airstreams) to reach full effectiveness. Storage time and conditions may make the permanently bonded desiccant dormant, which can be quickly reactivated by cycling the rotor between dry and humid airstreams.

IV. MAINTENANCE AND TROUBLESHOOTING

The following routine inspection and maintenance must be done after 200 hours operation and carried out at least every three months thereafter--more frequently if dirty, hot or corrosive air is being handled.

1. Wheel bearings should be greased with a quality general purpose lithium or aluminum-based grease suited for the operating temperatures included. These bearings are factory lubricated with a heavy duty multi-purpose lithium grease.
2. Verify that the seal brushes are properly adjusted as described in Start-Up and Operation. Replace the seals if the seal bristles have deformed or eroded to the point that they cannot be adjusted to obtain an acceptable seal.
3. The very “stretchy” urethane wheel drive belt should *not* require belt tension adjustment. If cracks or belt breakage occur, it may be repaired by the following fusing procedure:
 - a. *Tools Required*
 - 1) Razor blade (or sharp knife).
 - 2) Propane torch or spade-tipped soldering gun.

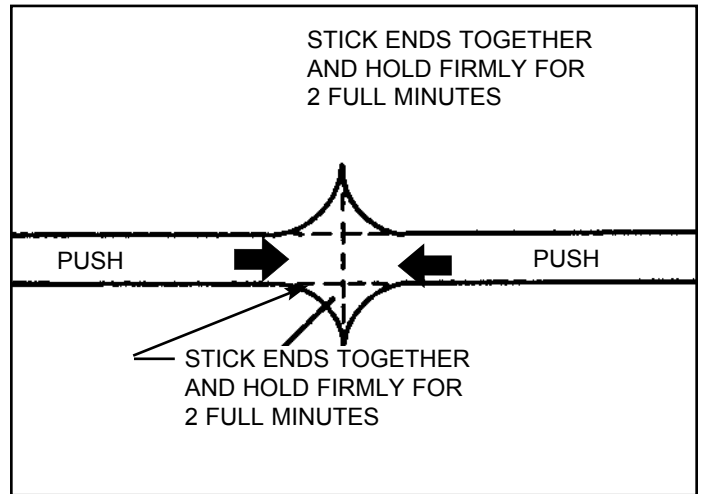


b. *Preparation*

- 1) Route the belt so the closed loop will be properly located with no twists.
- 2) Arrange the belt so its not under tension while welding. The finished belt should stretch 6-8 percent [about 7/8" (22mm) per foot] beyond its relaxed length when in operation. Note the relaxed length of a new rotor belt is *nearly tight* to the outer rim of the rotor itself.
- 3) Cut both ends of the belt *squarely* using the razor blade.
- 4) Weld the belt in an open or ventilated area to minimize inhalation of the fumes.

c. *Welding*

- 1) Hold both ends of the belt in the outer ring of the propane torch flame until the ends soften visibly. Note that slight blackening of the belt material is no problem, but it should not be charred excessively. The material can burn, but extinguishes when removed from the torch flame.
- 2) Immediately push the belt ends firmly and squarely together for two minutes. The softened material should "mushroom" out when this is done.
- 3) After belt has cooled for at least 10 minutes, trim the flash from the welded joint. If two people can pull the weld apart, repeat the above process.



5. Wipe the lenses clean of the optional detector and reflector. If optional thermostats, timers, speed controllers or pressure switches are located where tampering may be a problem, verify that settings are acceptable.
6. Inspect the rotor surface for accumulated dirt and debris. Depending on the nature of any accumulation, it may be gently swept from the rotor surface or blown away with a compressed air nozzle.
9. If the wheel does not appear to operate properly, check the following items:
 - a. Seal brushes adjusted properly. (Can rotor be turned readily by hand?)
 - b. Drive belt broken, not slipping and properly aligned sheave-to-rotor. (Does the gearmotor output shaft turn?)
 - d. All electrical switches, fuses, circuit breakers, overload relays and interlocks operating. (Does voltage reach motor, optional speed controller or optional timer?)
 - d. All adjustments properly made to optional speed controller, thermostats, timer, rotation detector and/or pressure switches per Carnes wiring diagrams.
 - e. Rotor bearings properly lubricated.
 - f. Rotor surfaces free of debris.
8. If a segmented wheel is provided, the same procedures will prevail as a standard one piece wheel.

NOTE: The segmented wheel may be provided with upto twenty-four (24) pieces.

