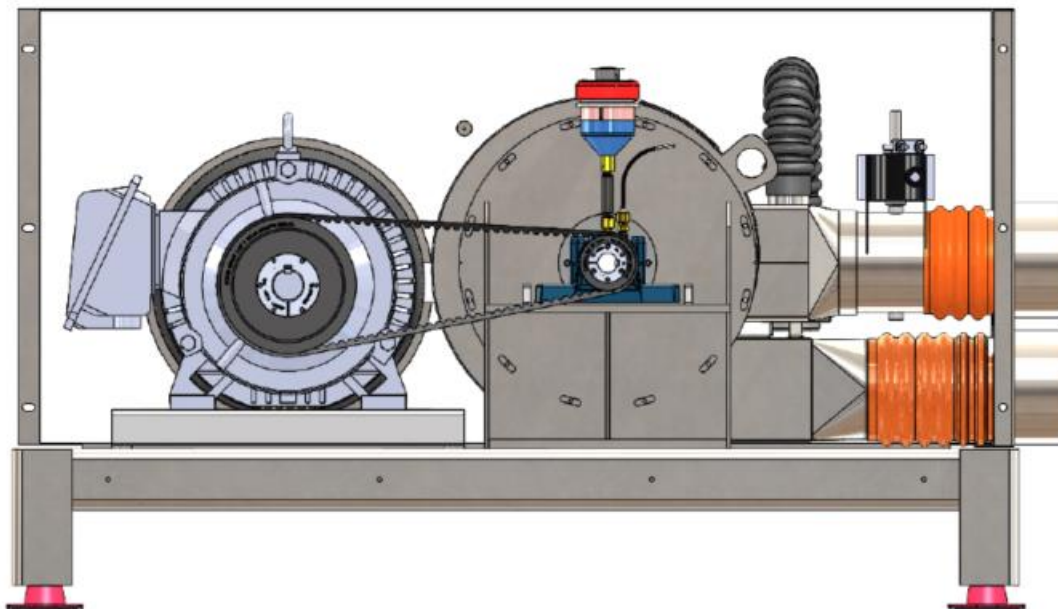


## ***OPERATION AND MAINTENANCE MANUAL***



# ***TURBINE SERIES 5***

HENLEX INC. - 2600 DIAB, MONTREAL, CANADA  
514-339-2522 – 1-800-922-2522

# TABLE OF CONTENTS

<b>1. GENERAL.....</b>	<b>3</b>
1.1 INTRODUCTION .....	3
1.2 WARRANTY.....	3
1.3 RECEIVING AND HANDLING .....	3
1.4 INSTALLATION.....	3
<b>2. OPERATION .....</b>	<b>4</b>
2.1 PREVENTION BEFORE START UP .....	4
2.2 START UP .....	4
<b>3. MAINTENANCE .....</b>	<b>5</b>
3.1 BELT DRIVE.....	5
3.2 TURBINE PILLOW BLOCK BEARINGS .....	6
3.3 MOTOR .....	9
3.4 TROUBLESHOOTING .....	10
3.5 PARTS IDENTIFICATION.....	11

# 1. GENERAL

## 1.1 INTRODUCTION

This manual is designed and produced to help you keep your equipment in the best operating condition. Our goal is to manufacture the best equipment possible and to be able to solve your pollution problems.

By giving it the attention it deserves, your Henlex equipment will give you maximum performance at a minimum cost. We are confident that this device will become a very valuable asset for your business.

Our interest in your equipment doesn't end with its sale. We are interested in keeping in constant contact with your company. If you have any questions or problems, please do not hesitate to contact us.

## 1.2 WARRANTY

All Henlex Inc. products are warranted against defects in materials for a period of one (1) year from the date of shipment. Defective parts and components will be replaced or repaired at no charge at our Montreal plant. An authorization number must then be obtained with any return of goods. Henlex will not be held liable for indirect damages caused by misuse of the system or for reinstallation costs. Products not manufactured by Henlex Inc. carry the manufacturer's warranty. The warranty against corrosion is limited to that given by suppliers of building materials or protective coatings. The warranties are valid for normal use of your system's operation.

## 1.3 RECEIVING AND HANDLING

Ensure that all goods described on the delivery note are included and not damaged.

The equipment is carefully inspected and prepared at the factory for shipment, but the impeller, cabinet, and drive parts can sustain damage along the way as a result of improper handling.

The equipment with a cabinet can be lifted using a forklift. Non-cabinet equipment must be lifted using a hoist or lifted using chains attached to the base only. Never place chains under the turbine or engine shaft.

## 1.4 INSTALLATION

The units installed inside a building must be in a clean and well-ventilated environment in order to maintain a maximum temperature of 40°C (104°F). There must be enough space all around the unit for disassembly and maintenance and ensure that there are no obstructions on the cabinet louvers.

The structure where the turbine base will sit must be strong enough to keep the unit level. Place the four anti-vibration pads under turbine base and add shims for leveling if necessary.

The electrical connection to the motor must include a circuit breaker with fuses and a magnetic starter with thermal protection. Make sure that the current source (voltage, frequency, capacity of the wires, and connection) matches the motor plate.

The motorized (normally closed) damper installed at the turbine suction (inlet) must be connected so that it is energized only when the turbine start-up is complete.

## 2. OPERATION

### 2.1 PREVENTION BEFORE START UP

- Check the tightness of all bolts on the turbine unit, motor, slide base and pillow block bearings.
- The impeller access door must well adjusted and sealed.
- Check the lubrication of the pillow block bearings. See the MAINTENANCE section.
- Check the alignment of the pillow block bearings. (Manually turn the turbine shaft and see if the aluminum seal rings on the bearings rotate well and stop rotating at the touch of a finger).
- Check the electrical connections of the motor and the motorized shutter.
- Adjustment of the thermal protection according to the intensity written on the motor plate.
- Tighten the mounting bolts of the shaft seal plates to the impeller.
- For turbines equipped with a cabinet, ensure that the flexible hose turbine connections and the air supply line to the motor are tightened.
- Ensure that an air filtration device is present in the piping system for applications where particles larger than 100 microns are transported.
- The pulleys must be aligned and the belts tensioned properly. See the MAINTENANCE section.
- Connection of air pipes to the inlet and outlet of the turbine. All duct joints must be sealed to prevent air leakage.
- Connection of the filter units with tank in place and access door closed.
- Workstations or air inlets can all be closed at initial start-up and then opened gradually. The use of an amperemeter will be necessary at start-up in order to verify the current of the motor with the prescribed quantity of stations in operation.
- Before shipping, the turbines underwent a full function test to verify their balancing.

### 2.2 START UP

- Turn on the turbine motor for 2 seconds to check the direction of rotation. Interchange 2 wires (2 phases) to reverse the rotation if necessary. (The direction of rotation of the turbine is indicated on its frame.)
- Run the turbine at full throttle and check for vibration or overheating of the bearings (could go up to 120°C/250°F) and motor.
- Check the intensity of the current to the motor following the addition of the air inlet.
- At the slightest sign of a problem or vibrations, shut down the turbine. See the "PROBLEMS IN OPERATION" section.

### 3. MAINTENANCE

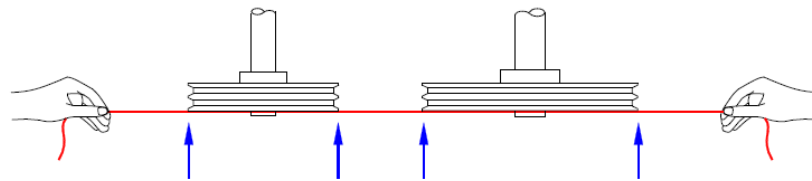
Applying sustained maintenance to the unit helps prevent costly and unplanned repairs and provides a unit that can provide years of efficient service.

#### 3.1 BELT DRIVE

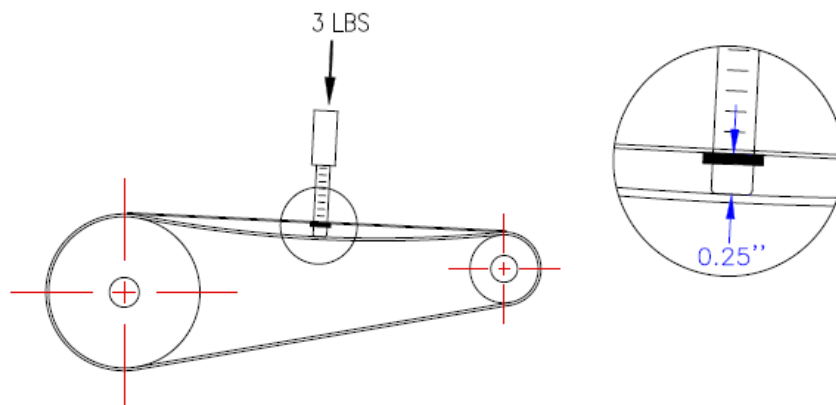
Henlex turbines are driven by high-efficiency Super HC 3VX475 belts. It is essential to install correctly and regularly check the alignment and tension of the belts to avoid problems with premature wear, instability and vibration transmitted to the bearing.

##### PRECAUTIONS DURING INSTALLATION:

- Align the turbine and motor shafts so that they are parallel. Checking tension and alignment.
- The alignment should be checked using a thin rope tightly stretched across the faces of the two pulleys. Check the parallel and angular alignment of the pulleys. They have to be perfect. The rope must make contact simultaneously with the peripheries of the two pulleys



- Before checking alignment and tension, make sure that the turbine and engine anchor bolts and its base are tight.
- The use of a tensiometer is necessary to properly check the tension of the belts. Refer to the drawing for procedure and tension value for your turbine model. Insufficient tension causes slippage and premature wear. Too much tension causes excessive pressure on the bearings.



- Run the belts for a few turns, then double-check their tension and adjust if necessary.
- Clean the motor and turbine shafts before installing the pulleys.
- Always move the motor forward on its slide base to remove or install the belt on the pulleys. Do not roll the belts over the grooves of the pulley.
- The shaft key must be securely in place in the key path of each pulley.
- Perform a visual check of the belt. At the slightest presence of cracking or irregular wear, Replace it.

### 3.2 TURBINE PILLOW BLOCK BEARINGS

It is necessary to check and lubricate the bearings pillow blocks at regular intervals. The frequency of inspections depends on the use and location of the system. The bearings delivered assembled with the turbines have been properly lubricated at the factory.

The bearings should be filled with grease and the bottom housing should be filled to one-third (1/3). Make sure that no moisture or dust gets into the bearings when you remove the top half of the bearing.

The bearings can have an operating temperature of 250°F (120°C). Running temperature alarm devices should be adjusted to 230°F (110°C). The temperature sensor is installed on the bearing pillow block of the pulley side.

Overheating of the bearings may indicate poor lubrication or excessive vibration.

Operating turbines above alarm thresholds may cause failure and serious damage to the bearings/turbine.

Normal operating vibration levels are between 0.10"/sec. and 0.20"/sec. If it is above 0.40"/sec. the turbine will have to be shut down and a complete inspection of the turbine is necessary.

#### A) LUBRICATION

The grease used in this turbine is POLYREX EM. Bearings must be relubricated every 500 hours of operation. The grease used must be removed from the bearings every 2000 hours and the bearings cleaned.

Bearings #1206 and #2206 require 4g of new grease at each relubrication cycle (500 hours interval), the equivalent of 4 pump strokes on the grease gun.

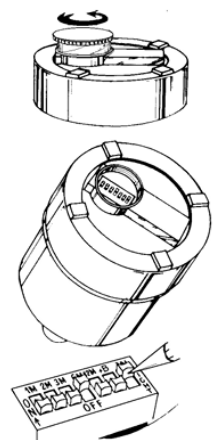
#### AUTOMATIC LUBER

Automatic lubers operate on a monthly schedule. When replacing, you should empty and clean the bearings and add new grease, according to the "Lubrication" procedure.

To active the automatic luber :

- Unscrew the top cap
- Using a pencil tip, put it to the "ON" position
- Using a pencil tip, put in to position according to your use :
  - o **6M** = 2 or 3 shifts / day
  - o **12M** = 1 shift / day

Once the automatic luber is empty, it should be discarded, as it is not refillable.



## **B) CLEANING**

To clean the bearings, soak them in a clean petroleum remover and wipe all parts with a clean cloth. The bearings can be cleaned without taking them out by pouring solvent into the lower housing (manual degreasing) while rotating the shaft slowly. Drain the solutions through the bottom drain and rinse again. Once the bearings are clean and dry, ready for lubrication, grease the ball bearings manually and the housing less than a third (1/3). Do not exceed one third as the bearings may overheat.

When cleaning or installing bearings, it is important not to mix the parts of each. New bearings are coated with a grease-compatible solution, so there is no need to remove it.

## **C) DISASSEMBLY PROCEDURE**

1. Remove the lock washer shank from the lock nut notch.
1. Loosen the lock nut using the appropriate "C" wrench.
1. Dislodge the bearing from the sleeve using a brass or mild steel bar and then a hammer by striking the inner crown of the bearing until it releases.
1. In order to disassemble the bearings, it is necessary to remove the bolts from the pillow block bearing and loosen the bolts from the sealing plate. Remove the bearing with all internal parts by lifting the turbine shaft.

## **INSTALLATION OF THE PILLOW BLOCK**

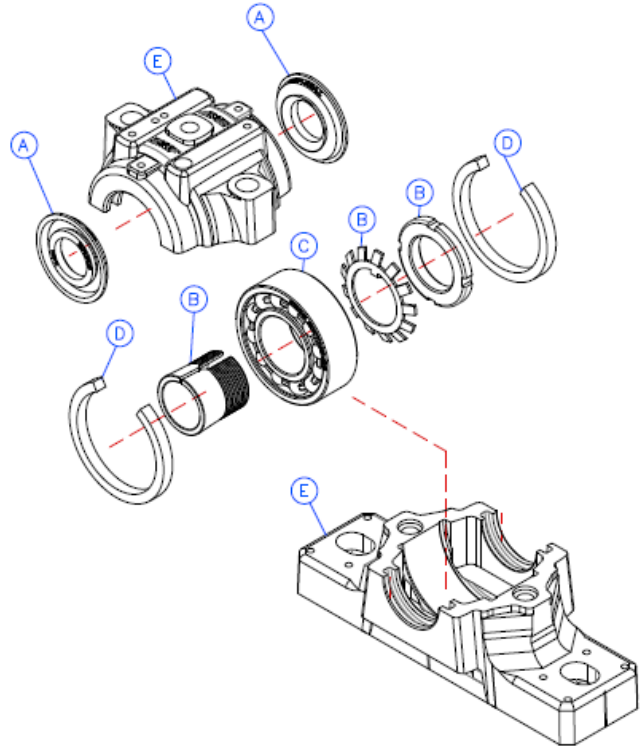
The pillow block bearing located at the front of the turbine (pulley side), contains two "C" fastening rings in order to limit the axial movements of the turbine impeller. When mounting this bearing, make sure that the impeller is located in the center of the turbine inlet.

## **D) ASSEMBLY PROCEDURE**

1. Gaskets will need to be inspected carefully before installation. If there is a notch or deformation, they will have to be replaced. The shaft should be clean and free of oil or grease.
2. Lightly grease the contour of the sleeve threads and the surface of the lock nut to facilitate tightening.

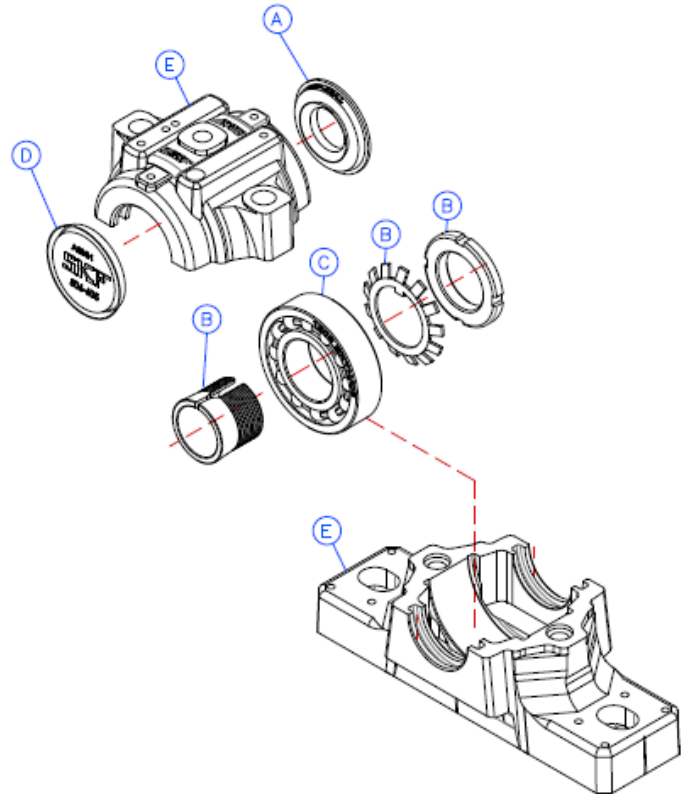
## FRONT BEARING ASSEMBLY (PULLEY SIDE)

- A) Pillow block seal # TSN506A (4 pieces)
- B) Sleeve # H 306 (3 pieces)
- C) Bearing # 2206 EKTN9/C3
- D) Fixing ring # FRB6/62 (2 pieces)
- E) Pillow block SNL 506-605 (2 pieces)

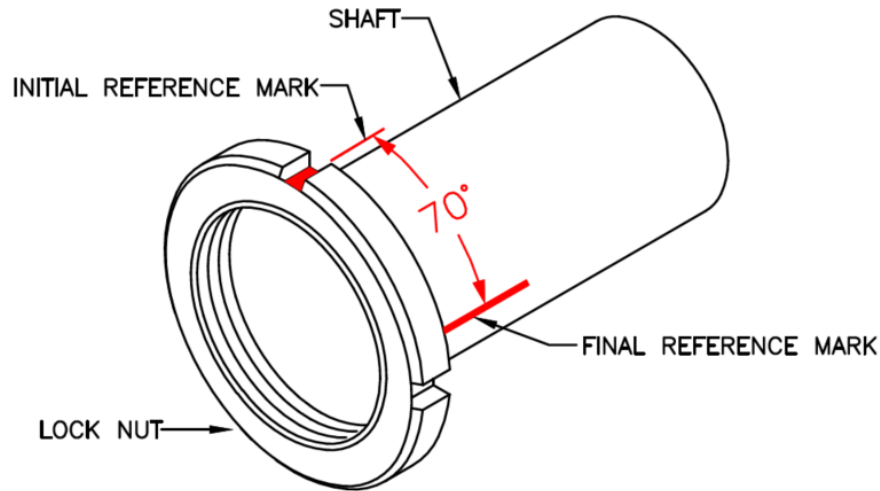


## REAR BEARING ASSEMBLY (OPPOSITE SIDE PULLEY)

- A) Pillow block seal # TSN506A (2 pieces)
- B) Sleeve # H 206 (3 pieces)
- C) Bearing # 1206 EKTN9 /C3
- D) Cap # ASNH 506-605
- E) Pillow block SNL 506-605 (2 pieces)



3. Place the lower housing under the shaft and bearing, taking care to locate the sealing rings in the corresponding grooves in the housing, then slide everything over the shaft. You'll need to lift the shaft a bit. Center the impeller for the no-load bearing (Opposite side from the pulley).
4. Tighten the lock nut with the appropriate "C" wrench until the inner ring of the bearing is pushed deep into the sleeve (tightening with hand pressure on the wrench). Make a mark on the shaft and lock nut, then tighten with the wrench and a hammer until the lock nut moves **70°** on both bearings.



5. Lock the lock nut by arching the tail of the lock washer into the notch. Tighten to match a notch if necessary. Never loosen the lock nut.
6. Make sure that the sealing rings leave an even spacing all around with the top of the case in place. Align with shims, making sure the ring rotates freely in the grooves.
7. Bolt in place the bottom of the case to the lower part of pillow block and then recheck the sealing rings.
8. Lubricate and then tighten the upper part of the housing.

### 3.3 MOTOR

The unit's motor has a power of 20HP and is a TEFC having sealed bearings. Therefore, it is impossible to lubricate the bearings. Periodic checking is recommended to ensure that the vibration level is acceptable so as not to affect the life of the bearings.

### 3.4 TROUBLESHOOTING

#### A) REDUCED VACUUM OR AIR FLOW

- Wrong direction of rotation of the turbine.
- Motorized shutter partially or totally closed.
- Air leakage in the system.
- Obstruction in the air duct network.
- Quantity of users or simultaneous air intake greater than planned.
- Flexible hoses that are too long or clogged.
- Loose turbine flexible hose (inside cabinet).

#### B) MOTOR OVERLOAD

- Air flow exceeds capacity.
- Air leakage in the system.
- Quantity of users or simultaneous air intake greater than planned.
- Pulleys misalignment.
- Poor lubrication of the bearings.
- Cabinet air intake (louvers) clogged or pipes not properly attached to the engine.
- Turbine or environment poorly ventilated.
- Friction of the impeller inside turbine.
- Motor wires not properly connected.

#### C) BEARING OVERHEATING (greater than 250°F or 120°C)

- Too much grease in the pillow blocks bearings (or insufficiency).
- Misalignment of the pillow blocks bearings.
- Excessive belt tension.
- Damaged impeller.
- Distorted shaft
- Dirt in the pillow blocks.

#### D) VIBRATION AND NOISE

- Unstable base or loose bolts.
- Foreign object in the turbine or on the impeller.
- Damaged or unbalanced impeller, pulley or motor.
- Turbine air flow exceeds its capacity.
- Misalignment of pillow block or pulleys.
- Worn pillow blocks/bearings
- Vibration from another source transmitted to the turbine.

#### E) CONTINUOUS VACUUM FLUCTUATION.

- Insufficient air flow to the turbine (air intakes all closed).
- Vacuum breaking valve lost his adjustment (if equipped). Ensure that there is a minimum airflow to the turbine to reduce the operating vacuum when all air intakes are closed.

### 3.5 PARTS IDENTIFICATION

19	1	OVERHEATING SYSTEM
18	1	MOTORISED SHUTTER
17	1	MOTOR
16	1	TURBINE
15	1	RAIN CAP ACCELERATOR
14	4	VIBRATION INSULATOR
13	1	TURBINE INLET FLEXIBLE CONNECTION
12	1	TURBINE OUTLET FLEXIBLE CONNECTION
11	1	MOTOR FLEXIBLE CONNECTION
10	1	AIR SUPPLY DUCT TO THE MOTOR
9	1	EVACUATION LOUVER
8	1	AIR SUPPLY LOUVER TO THE MOTOR
7	1	MUFFLER
6	1	ACCESS BIG PANNEL
5	1	ACCESS LITTLE PANNEL
4	1	MOTOR CONNECTION PANEL
3	1	TURBINE CONNECTION PANEL
2	1	COVER
1	1	BASE
ITEM	QTY	DESCRIPTION

