

# Instruction Manual



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**BACKWARD INCLINED FANS**

(BI)

For "THERMO" High Temperature Fans with Belt Drives

**EP-202**

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Rev. 1

## RECEIVING

***This equipment should be carefully inspected before accepting shipment from the transportation company. Any damage discovered either before or after acceptance of the equipment should be immediately reported to the carrier and to Industrial Gas Engineering (IGE).***

Before starting this fan for the first time and with drive motor electrically isolated, rotate the fan shaft by hand to be sure that there are no restrictions to its free turning.

Do not lift a housing type fan by the inner scroll outlet or inlet flange connections as they are not designed for the heavy loads required to lift the entire fan structure. ***Use the lifting eyes on the outer housing to lift the entire unit.***

If the fan is not put into service immediately, proper storage methods should be used. Bearings and exposed metal should be protected from moisture or foreign material exposure. The fan shaft should be rotated (min. 180°) monthly to prevent damage to the bearings.

Always give your dealer the serial number of your Backward Inclined Fan when ordering parts or requesting service or other information. Please record this information in the table below for easy reference.

<b>Model Number</b>	
<b>Serial Number</b>	
<b>Date Received</b>	

## INSTALLATION

When mounting the fan, all mounting holes must be used. Fan must be adequately supported to avoid vibration problems due to structural resonance.

Customer must provide a suitable gasket at fan mounting flange on sealed applications. On vacuum applications, *IGE* will provide an O-ring for the mounting flange to mount against customer's machined flat surface.

Fan housing inlet and outlet connections require a slip connection or expansion joint to allow for thermal expansion. Inlet and outlet connections are not designed to support duct work.

**CAUTION:** Uninsulated fans should be insulated or guarded by the customer to prevent physical contact with hot surfaces that could cause injury or a dangerous condition.

If the fan is to be belt driven and the fan and motor sheaves are not *IGE* factory mounted, the fan sheave and motor sheave must be balanced and in alignment with a matched set of properly tensioned v-belts when mounted. Improper alignment or belt tension can cause excessive horsepower draw (high amperage), premature v-belt wear, and/or early bearing failures. All electrical connections and electrical grounding should follow local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

**CAUTION:** Do not install or operate water-cooled fan units on a hot furnace (over 150° F) without constant water flow. It is important to use an adequate pressure relief valve (75 PSI or lower) directly connected to the water inlet or outlet pipe on a closed water system. Confined water, exposed to heat, could result in a dangerous condition.

**CAUTION:** Industrial Gas Engineering fans are constructed for a special purpose. It is important not to exceed their limitations as a dangerous condition may result. Do not operate this fan if it is not equipped with safety guards as required by OSHA regulations. OSHA conforming guards are available from *IGE* for all *IGE* fans and can be furnished upon request.

AIR-COOLED FANS: On air-cooled fan units, the fan shaft and bearings are cooled by the operation of the fan. Do not stop the fan if the internal furnace temperature exceeds 150° F. Air cooling ports must never be obstructed as bearing damage could result. If the ambient air temperature in the area where the fan is to be mounted exceeds 120° F, consult the *IGE* engineering department for supplemental cooling methods.

Note: In air-cooled units with brass shaft cooling bushings, the cooling efficiency depends solely on the negative pressure created by the rotation of the fan wheel in the furnace interior.

The *IGE* engineering department should be consulted for applications where the furnace is completely sealed or where the furnace is under a positive absolute pressure.

**WATER-COOLED FANS:** The fan shaft and bearings are cooled by maintaining the flow of water through the unit. The water should be kept on at all times when the motor is operating and/or when the internal furnace temperature exceeds 150° F. The temperature differential between water inlet and water outlet at the plug should not exceed 15° F. When water-cooled fan units are to be mounted outdoors in areas that may be subjected to temperatures below 32° F, an antifreeze solution (non-alcohol base) must be added to the water recirculating system. Consult the *IGE* engineering department for approximate water flow rates.

Cooling water inlet temperature should not exceed 85° F or damage to bearings may result. Cooling water should also be free from sludge or foreign matter which could cause blockage in the water-cooled passages resulting in damage to the fan and/or create a dangerous condition. Consult the *IGE* engineering department for other operation.

**NOTE:** Water-cooled fan units and air-cooled fan units are not interchangeable.

**CAUTION:** This fan was carefully balanced as a complete unit before shipment. Do not operate this fan if vibration from an out of balance condition is evident. An unbalanced wheel will cause premature failure of the fan and/or could create a dangerous condition. It is recommended that the amplitude of vibration be checked on a periodic basis and the balance corrected as required. Vibration displacement levels are shown below in TABLE #1:

TABLE #1

Fan RPM	Vibration Displacement - Mils (peak-to-peak)			
	Smooth	Fair	(danger-correction required) Rough	Very Rough
600	2.0	4.0	8.0	12-20
900	1.5	2.75	6.0	8-10
1200	1.0	2.0	4.5	6-8
1800	0.75	1.5	3.5	5-7
3600	0.50	1.0	2.0	3-5

Fan should not exceed temperature or RPM design limitations.

Fans should not be subjected to temperature change rates above 15° F/min. as damage from thermal shock may result.

## MAINTENANCE

**CAUTION:** Follow all plant safety regulations as well as common sense precautions to avoid injury.

For maximum life and trouble-free service of this fan, a periodic maintenance schedule is recommended.

**LUBRICATION:** The bearings furnished with this fan have been lubricated at the factory for the initial run-in period. Grease intervals and grease selection as recommended by the bearing manufacturer are described on page 5. If a grease is to be used other than what's shown, it is advisable to consult the bearing manufacturer for suitability. Do not mix base oil and soap types. Do not over grease.

**FAN DRIVE:** If this fan is belt driven, the belt tension should be checked eight hours after the initial start up and adjusted accordingly. It is important that proper belt tension be achieved. High belt tension can cause fan and motor bearing failures. Loose belts can slip causing wear and problems with sheaves, bearings, shafts and motors. Belt tension should be tensioned to the belt manufacturer's recommendations. When replacing worn belts, replacement belts should be a new matched set.

Check vibration displacement level on a periodic basis. Monitor at fan bearings.

Check all mounting bolt and set screw tightness. Tighten all locking devices after 500 hours or 3 months of operation, whichever comes first. Tighten bearing set screws again at 6 months.

**CAUTION:** Assume that all fan members or components are very hot and physical contact should be avoided to prevent injury.

## LUBRICATION

Bearings have been factory pre-lubricated with high quality grease. The re-lubrication interval depends on bearing operating conditions: speed, temperature and environment. See TABLE #2 below for typical re-lubrication schedule:

TABLE #2

Speed	Temperature	Cleanliness	Grease Interval
100 RPM	Up to 120° F	Clean	6 to 12 Months
500 RPM	Up to 150° F	Clean	2 to 6 Months
1000 RPM	Up to 210° F	Clean	2 Weeks to 2 Months
1500 RPM	Over 120° F	Clean	Weekly
Any Speed	Up to 150° F	Dirty	1 Week to 1 Month
Any Speed	Over 150° F	Dirty	Daily to 2 Weeks
Any Speed	Any Temp.	Very Dirty	Daily to 2 Weeks
Any Speed	Any Temp.	Extreme Conditions	Daily to 2 Weeks

Bearings can be re-lubricated either while stationary or running. However, for safety reasons, re-lubrication is suggested while the fan is shut off. Always follow plant safety procedures and OSHA requirements. Consult *IGE* for abnormal operating conditions.

### RECOMMENDED GREASES (For Normal Service, TABLE #3)

Manufacturer	Grease
Mobil	Mobilith AW2
	Mobil Grease HP
Exxon	Unirex N2
Texaco	Premium RB
Shell	Alvania 2
	Alvania EP 2
	Gadus S2-V220-2
All above are Lithium base greases	

## RECOMMENDED RELUBRICATION GREASE CHARGE

TABLE #4

Bearing Bore Diameter & Type		Grease Charge
Standard Duty	Medium Duty	(Mass-Ounces)
1 1/4 - 1 7/16	1 3/16	0.13
1 1/2 - 1 9/16	1 7/16	0.18
1 5/8 - 1 3/4	1 1/2	0.20
1 13/16 - 2	1 11/16 - 1 3/4	0.22
2 - 2 3/16	1 15/16	0.30
2 1/4 - 2 7/16	2 3/16	0.38
2 1/2 - 2 11/16	2 7/16 - 2 1/2	0.53
2 13/16 - 2 15/16	2 11/16	0.62
3 - 3 3/16	2 15/16	0.88
3 1/4 - 3 7/16	3 3/16	1.11
3 1/2	3 7/16	1.37
3 15/16 - 4 3/16	3 15/16 - 4	2.50
5	4 7/16 - 4 15/16	3.91

## INSPECTION

**CAUTION:** Before inspecting the fan or the system, it will be necessary to shut down and stop the fan during inspection. The fan system must be electrically isolated and adequately grounded according to the National Electrical Codes. Disconnect switches and other controls must be locked in the “off” position. Precautions must be taken to prevent the motor from accidentally becoming energized.

When inspecting the fan, all material and welds should be checked for wear, corrosion or cracking that may reduce material strength and could cause failure, damage and/or a dangerous condition.

Problem	Cause	Solution
Fan Does Not Run	Blown Fuse or Tripped Breaker	Replace Fuse or Reset Breaker
	No Power at Fan	Turn Power on at Source
	Defective Wiring or Connection	Check for Loose Connections
	Defective Magnetic Starter	Check Contactor for Proper Function
	Defective Motor	Replace Motor
Fan Runs for a Short Time, Then Shuts Off	Undersize Wiring	Refer to Wiring Charts
	Overload Device is Tripping	Check Temperature of Motor
	Defective Magnetic Contactor	Replace the Contactor
	Defective Start/Stop Switch	Replace Switch
Fan Makes a Clicking or Rubbing Noise	Debris on Fan Blade	Clean Fan Blades
Fan Vibrates Excessively	Debris on Fan Blade	Clean Fan Blades
	Bent Shaft or Fan Blade	Replace Shaft or Fan Wheel
	Unbalanced Fan Wheel and/or Motor	Replace Fan Wheel and/or Motor
	Damaged Bearings	Replace Bearings



## RECOMMENDED HANDLING PROCEDURES

### CAUTION

#### **This unit contains a mineral wool or ceramic fiber product**

1. Minimize airborne fiber. A NIOSH- or MSHA-approved high efficiency air purifying respirator mask (3M 8710 or equivalent) should be used if airborne concentrations exceed 2 fibers/cc. For airborne concentrations greater than 5 fibers/cc., consult the *IGE* factory.
2. Wear long-sleeved, loose fitting clothing, gloves and eye protection when handling wool or fiber products. Do not wear contact lenses.
3. Wash exposed skin areas gently with soap and warm water after handling wool or fiber product.
4. Avoid taking unwashed work clothes home. Wash work clothes separately from other clothing. Rinse washing machine thoroughly after use.
5. Particular care should be taken when working with "used" ceramic fiber material that has been in service at elevated temperatures (greater than 1600° F.) since such product may undergo partial conversion to cristobalite—a form of crystalline silica that can cause respiratory disease. The intended threshold limit value (on a time weighted average basis) for cristobalite is 0.05 mg/m<sup>3</sup>. A NIOSH- or MSHA-approved high efficiency air purifying respirator mask (3M 8710 or equivalent) should be used in situations exceeding such levels.
6. All wool or fiber used in *IGE* products are asbestos free.

## FAN REPAIRS

**CAUTION:** All workmanship and materials are guaranteed for one year from date of shipment from *IGE* factory. Only *IGE* factory repairs or alterations are authorized on this equipment as a dangerous condition could result if repairs or alterations are not made at the *IGE* factory.

*IGE* has complete repair facilities and also offers replacement parts at economical prices with very short lead times. Consult *IGE* if you have any questions about your fan parts.

## REPLACEMENT PARTS



**Bearings**



**Inlet Cones**



**Motors**



**Heat Slingers**



**Sheaves & V-belts**



**Stuffing Boxes**



**OSHA Guards**



**Bearing Housings**



**Wheels**



**Lip Seals**



**Housings**



**Shafts**

# EXPLODED VIEW OF PARTS

## TYPE "BI" THERMO CARTRIDGE ASSEMBLY

