PATHFINDER SYSTEMS Inc.

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MASTER MANUAL PACKAGE

2021

(To print you should fit to size in print settings)

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Safety Disclaimer

- It is your responsibility to work safely around this equipment. Pay attention to safety decals such as warnings, cautions, and electric hazards.
- Always work safely when installing metal products and use extreme caution on the roof at all times.
- Wear gloves and safety glasses to reduce the risk of injury, and use hearing protection when operating power tools.
- Safety harnesses or other special equipment may be required; be sure to consult OSHA guidelines for compliance with all safety requirements.
- Do NOT walk on panels until all the fasteners are installed. Metal roofing panels are slippery when wet, dusty, frosty, or oily -- Do NOT attempt to walk on a metal roof under these conditions.
- Only a qualified electrician must work on electrical motors and the motor must be disconnected from supply lines.
- Be sure to check the equipment regularly. Loose connections, damaged cables or wiring points that have not been closed correctly are a danger for the operating staff or the environment. The device has to be stopped and disconnected immediately from all supply lines and the damage must be repaired or replaced.

Receiving and Unpacking

Prior to unloading, compare the received goods to your packing slips for quantity and descriptions. Review the items received for any damage. This should include any punctured packaging, scratches, dents or other signs of distress. Record any discrepancies or damage on the packing slip prior to signing of the packing slip. Also, report any discrepancies or damage within 24 hours to the shipping company.

Installation and Operation

Extended or Outside Storage Guidelines

If you are NOT installing the equipment immediately (within 30 days), use the following as a **general guideline** to prepare and maintain the equipment during storage.

1. Coat internal surfaces of airbox and impellers with a petroleum based product (mineral oil). Fill the gear box and drive side sump completely with oil. (For Roots blowers, Dresser Roots recommends using their own brand of oil.)

IMPORTANT

Oil must be drained and refilled with the proper lubrication and level before operation.

2. Coat internal surfaces of air box and rotors with a petroleum based product.
3. Cover inlet and discharge with plastic (for long-term storage over 1 month)
4. Rotate the shaft 3-4 revolutions every 2 weeks.
5. Repeat steps 1 and 2 once per year or as conditions require.

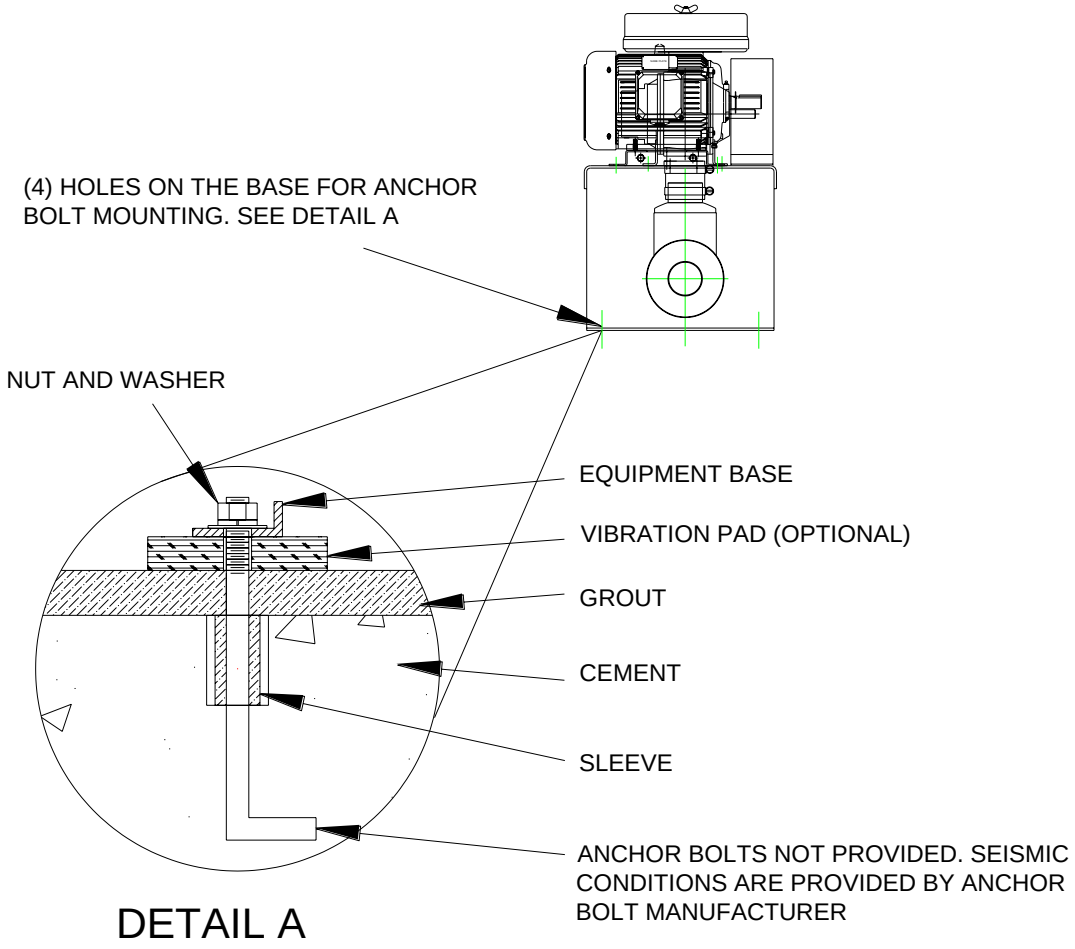
Blower Package Mounting Guidelines

Use the following as a **general guideline** to mount your blower package.

- Anchor Bolts – Expansion style bolts are not permitted. Shall be hook style or heavy duty epoxy style, such as the Hilti #HVA System, Red Head Concrete Anchoring Specialists, or the Chem-Stud® Anchor System. See the manufacturer's technical manual for specific information on these anchoring systems.
- Mounting Pads – A **general guideline** you can use is that the depth of inertia pad shall be twice the blower gear diameter and the pad's mass must be two times the mass of the blower, motor and drive. (Use 150 lbs/CF for concrete.) Housekeeping pads poured on top of finished floors are not acceptable.
- Leveling and Tensioning – Sometimes it is specified or desirable to use a second nut under the equipment base for purposes of leveling the base. UNDER NO CIRCUMSTANCES SHOULD THIS BE DONE. The result of doing so is complete lack of tension put on the anchor bolt. More equipment failures during this first year of operation are due to improper anchor bolt tension or selection than any other single thing.
- Grout – It is important to fill the area between the base and the pad (1" min. [25.4mm] fill) with grout and not concrete. Grout expands as it dries thus forming a tight fit whereas concrete shrinks and leaves a loose fit.

- Substructure – The inertia pad **guidelines** described herein are dependent upon having proper compacted soil substructure which will allow the inertia pad to remain flat, rigid, and free of resonant frequencies within the equipment operating range.

Blower Gear Size	Bolt Size			For Hook Style Bolt		
	Diameter	Length		Grade	Sleeves	
		Embedded	Total		I.D.	Length
2	1/2	6	9	5	2	4
3	1/2	6	9	5	2	4
4	1/2	6	9	5	2	4
4 1/2	1/2	8	11	5	2	6
5	1/2	8	11	5	2	6
6	1/2	10	13	5	2	7
7	5/8	12	15	5	3	10
8	5/8	14	17	5	3	10
10	3/4	18	21	8	3	15
12	3/4	18	21	8	3	15
14	3/4	18	21	8	3	15
16	1	24	27	8	3	18
18	1	24	27	8	3	18
20	1	24	27	8	3	18



DETAIL A

Installation

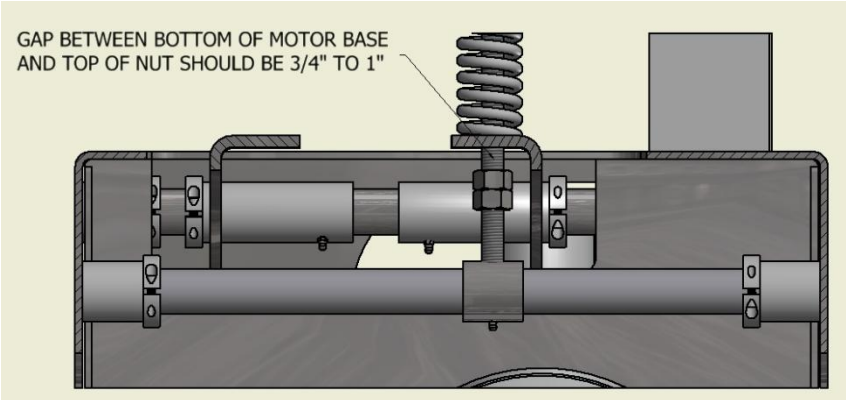
1. Use a fork lift truck or crane to transport the Blower Package to the installation location. Make sure that loosely supplied parts also remain with the equipment during the transport so that they are available on site for installation.
2. Anchor both items to the mounting pad.
3. Have a licensed electrician wire the motor. Refer to the manufacturer's manual (included) for instructions or call your sales representative if you need assistance.
4. Verify all mounting bolts are tight.

IMPORTANT
Blowers are shipped dry. Consult the manufacturer's manual (included) for lubrication information.
Do NOT run the blower without oil.

5. Fill the blower with oil. Make sure to consult the manufacturer's manual (included) for lubrication information. Roots recommends using their own brand of oil.
6. Turn the blower shaft by hand. Verify it does not bind or make any unusual noise.
7. Verify the blower breather/filter plug is installed.
8. If necessary, install the relief valve per the manufacturer's manual (included). Verify the relief valve is unrestricted.
9. If necessary, zero out the pressure or vacuum gauge.
10. If necessary, set the pressure or vacuum switch per the manufacturer's manual (included).
11. Have a licensed electrician wire the motor for the appropriate rotation. Some blowers are unidirectional. Consult the manufacturer's manual (included) for instructions or call your sales representative if you need assistance.
12. Bump the motor and verify the rotation is correct.
13. Run the motor for 15-20 minutes with no load. Verify correct operation of all components. Shut off the motor. Allow the blower to cool to room temperature and check the oil level. If necessary, add oil.
14. Connect the load. Start the motor and observe operation for the first hour. Watch and listen for unusual noises, vibration, oil leaks, air leaks, etc.
15. After the first 8 hours, shut off the motor and check your belt tension. If you need to purchase a belt tension gauge, call your sales representative. Your belt tension settings are located in this manual on page 2. Make sure you replace the belt guard before starting the motor.

The Spring Loaded Motor Mount utilizes a spring system to control belt tension. It has been sized and set at the factory specifically for your system. Your blower package will operate at peak efficiency limiting belt slippage and excessive belt tension.

16. To tighten your belt tension, turn the adjustment screw on the spring clockwise to move the motor away from the blower. To loosen your belt tension, turn the adjustment screw counter-clockwise to move the motor closer to the blower.



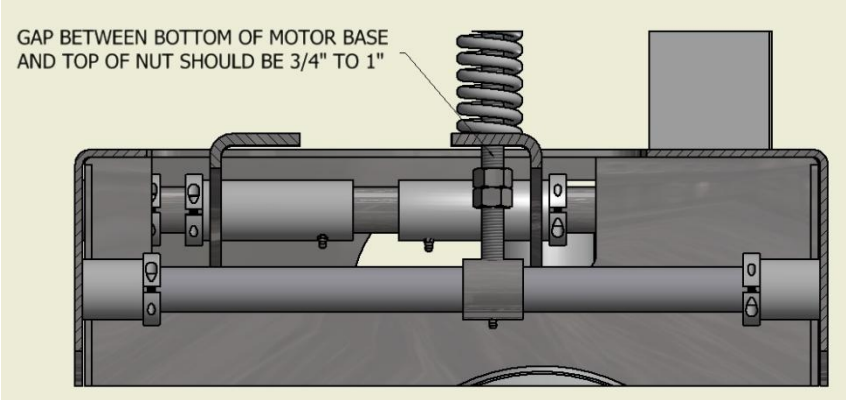
17. After the first 24 hours, shut off the motor and check your belt tension.
18. After the first 72 hours, shut off the motor and check your belt tension. Also, verify the intake filter/silencer is free of product.

Maintenance

1. Watch your oil levels in the blower. If possible, check your oil every day. Refer to the blower manufacturer's manual for the recommended lubrication schedule.

The Spring Loaded Motor Mount utilizes a spring system to control belt tension. It has been sized and set at the factory specifically for your system. Your blower package will operate at peak efficiency limiting belt slippage and excessive belt tension.

2. To tighten your belt tension, turn the adjustment screw on the spring clockwise to move the motor away from the blower. To loosen your belt tension, turn the adjustment screw counter-clockwise to move the motor closer to the blower.



3. Inspect the belts and check the belt tension every 3-6 months or more frequently depending on your operating conditions. If you need to purchase a belt tension gauge, call your sales representative. Your belt tension settings are located in this manual on page 2.

   Experience with specific equipment is the best guide to how often to inspect belt drives. Drives operating at high speeds, heavy loads, frequent stop/start conditions and at temperature extremes or operating on critical equipment require frequent inspection.

   Mark or note a point on the belt, or on one of the belts in a multiple V-belt drive. Wearing gloves, work around the belt(s), checking for cracks, frayed spots, cuts, or unusual wear patterns.

4. Check the sheave alignment every 720 hours. If using a straight edge (or string), line the straight edge along the outside face of both sheaves. If the drive is properly aligned, the straight edge or string will contact each sheave evenly. The straight edge or string (pulled tight) should touch the two outer edges of each sheave or pulley for a total of four points of contact. Misalignment of sheaves and shafts will show up as a gap between the outside face of the sheave and the straight edge. Check for tilting or shaft misalignment by using a bubble level. For proper alignment, the bubble should be in the same position as measured on each shaft.
5. Make sure you replace the belt guard before restarting the motor.
6. Inspect the intake filter/silencer every 40 hours or more depending on your operating conditions. The element should be clean and free of product. If you need replacement filter elements, contact your sales representative.

Blowers and Blower Package
Extended or Outside Storage Procedures

1) Coat internal surfaces of gearbox and drive side oil sumps with a petroleum based product. This can be accomplished by filling the oil sumps completely with oil. (For Roots blowers, Dresser Roots recommends using their own brand of oil.)

IMPORTANT: Oil must be drained and refilled with the proper lubrication and level before operation.

2) Coat internal surfaces of air box and rotors with a petroleum based product.

3) Cover inlet and discharge with plastic (for long-term storage over 6 months)

4) Rotate the shaft 3-4 revolutions every 2 weeks.

5) Repeat steps 1 and 2 once per year or as conditions require

Motor Drives

Direct Coupled
When installing the motor directly to the blower, align the shafts to the coupling according to the coupling manufacturer's instructions. Blowers shipped with the motor directly coupled and mounted on a common base have been aligned prior to shipment. Further alignment is not normally necessary, but be sure to check the alignment and make adjustments if necessary prior to starting the blower.

Coupling halves must correctly fit the blower and drive shafts so that only light tapping is required to install each half. The two shafts must be accurately aligned. A direct-coupled blower and motor must be aligned with the two shafts having no more than 0.005 in. (13 mm) Total Indicator Reading (TIR). Make sure the face is aligned within 0.002 in. (0.05 mm).

Establish proper gap between coupling halves according to the coupling manufacturer's instructions with the motor armature. Proper gap will minimize the chance for end thrust on the blower shaft. Re-align and grease all direct-coupled base-mounted blowers after field installation.

V-Belts
If the motor and blower are V-belt connected, the sheaves on both the motor and blower shafts should be as close to the shaft bearings as possible. Blower sheave is not more than 1/4 in. (6.5 mm) from the blower drive end cover. The drive sheave is as close to the driver bearing as possible. Take care when installing sheaves on the blower and motor shafts. Make sure the face is accurately in line to minimize belt wear.

Adjust the belt tension to the manufacturer's specifications using a belt tension tester. Check new belts for proper tension after 24 hours of run time. When manufacturer data is not available, industry guidelines recommend 1/64 in. deflection for each inch of span (0.157 mm deflection per centimeter of span) at 8 – 10 lb (3.6 – 4.5 kg) of force in the center of the belt.

Insufficient tensioning is often indicated by slipping (squealing) at start-up. Do not use belt dressing on V-belts. Keep sheaves and V-belts free of oil and grease. Remove tension from belts if the drive is to be inactive for an extended period of time. For more specific information, consult the drive manufacturer. In a V-belt drive, the blower sheave must fit its shaft accurately, run true, and be mounted as close to the bearing housing as possible to minimize bearing loads.

A tight or driving fit will force the drive shaft out of its normal position and cause internal damage. A loose fit will result in shaft damage or breaking. Make sure the motor sheave fits correctly and is properly aligned with the blower sheave.

Adjust the motor position on its sliding base so that belt tension is in accordance with drive manufacturer's instructions. Always avoid excessive belt tension. Recheck tension after the first 10 hours of operation and periodically thereafter to avoid slippage and loss of blower speed.

Check the blower after installation and before applying power by rotating the drive shaft by hand.

If the drive shaft does not rotate freely:
• Look for uneven mounting, piping strain, excessive belt tension, or coupling misalignment
• Check the blower to make sure oil was added to the reservoirs

Setting V-Belt Tension
Proper belt tension is essential to long blower life. Figure 5-4, Figure 5-5, and the following procedure are provided to aid in field-adjusting V-belts (when the blower is so equipped) for maximum performance. A visual inspection of the V-belt drive should yield the appearance shown in Figure 5-4.

Factors outside the control of the belt tensioning system used on an individual blower package assembly, such as environmental factors and quality of the belts installed, may contribute to decreased belt life. Such factors can cause wear of the belts beyond the ability of the tensioning system to compensate.

As such, it is recommended to check belt tension monthly and make any manual adjustments found necessary.

1. Turn off and lock out power.
2. Remove the belt guard fasteners (if equipped).
3. Remove the belt guard.
4. Check and adjust the belt tension as necessary. Tension should be 1/64 in. deflection per inch of span (0.157 mm deflection per centimeter of span) between sheaves, with 8 – 10 lb (3.6 – 4.5 kg) force applied at the center point of the top section of belt.
5. Install the belt guard, making sure that all drive components are free of contact with the guard.
6. Install the belt guard fasteners that were removed in step 2.
7. Unlock the power and start the blower.
8. Resume normal operation.

V-Belt Troubleshooting

PROBLEM	POSSIBLE CAUSES	SOLUTIONS
Belt slipping (sidewalls glazed)	Not enough tension	Replace belts; apply proper tension.
Drive squeals	Shock load	Apply proper tension.
	Not enough arc of contact	Increase center distance.
	Heavy starting load	Increase belt tension.
Belt(s) turned over	Broken cord caused by prying on sheave	Replace set of belts and install correctly.
	Overloaded drive	Redesign drive.
	Impulse loads	Apply proper tension.
	Misalignment of sheave and shaft	Re-align drive.
	Worn sheave grooves	Replace sheaves.
	Excessive belt vibration	Check drive design. Check equipment for solid mounting. Consider use of banded belts.
Mismatched belts	New belts installed with old belts	Replace belts in matched sets only.
Breakage of belt(s)	Shock loads	Apply proper tension; recheck drive.
	Heavy starting loads	Apply proper tension; recheck drive. Use compensator starting.
	Belt pried over sheaves	Replace set of belts correctly.
	Foreign objects in drives	Provide drive guard.
Rapid belt wear	Sheave grooves worn	Replace sheaves.
	Sheave diameter too small	Redesign drive.
	Mismatched belts	Replace with matched belts.
	Drive overloaded	Redesign drive.
	Belt slips	Increase tension.
	Sheaves misaligned	Align sheaves.
	Oil or heat condition	Eliminate oil. Ventilate drive.

Manual 2014 Rev D p/n 002014 0000

WARNING: Do Not Operate Before Reading Manual

Equalizer
OPERATOR'S MANUAL

Models

DF -	4504	4506	4509	4512
RM -	4604	4606	4609	4612
	6012	6016	6024	

800.825.6937 | www.mdpneumatics.com

Original Instructions

Disclaimer Statement:
All information, illustrations and specifications in this manual are based on the latest information available at the time of publishing. The illustrations used in this manual are intended as representative reference views only. Products are under a continuous improvement policy. Thus, information, illustrations and/or specifications to explain and or exemplify a product, service or maintenance improvement may be changed at any time without notice.

Product information and specifications subject to change.

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01 INTRODUCTION

CONGRATULATIONS on the purchase of a new **Equalizer® Rotary Positive Displacement Blower** from **M-D Pneumatics®**. Please examine the blower for shipping damage, and if any damage is found, report it immediately to the carrier. If the blower is to be installed at a later date, make sure it is stored in a clean, dry location and rotated regularly. Make sure covers are kept on all openings. If the blower is stored outdoors, be sure to protect it from weather and corrosion.

Equalizer blowers are built to exacting standards and, if properly installed and maintained, will provide many years of reliable service. Read and follow every step of these instructions when installing and maintaining the blower.

NOTE: Record the blower model and serial numbers of the machine in the OPERATING DATA form on the inside back cover of this manual. Use this identification on any replacement part orders, or if service or application assistance is required.

APPLICABLE DOCUMENTATION

The applicable documents associated with this manual are:

- 2006/42/CE – Machinery Directive
- EN 1012-1:1996 - Compressors and vacuum pumps - Safety Requirements - Part 1: Compressors

SCOPE OF MANUAL

The scope of this manual includes the bare shaft rotary positive displacement blower.

02

CONVENTIONS AND DATA PLATE

GRAPHIC CONVENTIONS USED IN THIS MANUAL

This manual is the result of a risk assessment according to the applicable documents referenced in ***Applicable Documentation on page 1***.

The following hazard levels are referenced within this manual:

⚠ DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a situation that can cause damage to the engine, personal property, and/or the environment or cause the equipment to operate improperly.

NOTE: Indicates a procedure, practice, or condition that should be followed in order for the equipment to function in the manner intended.

⚠ CAUTION

Read manual before operation or bodily harm may result. Attention should be given to the safety related sections of this manual.

DATA PLATE

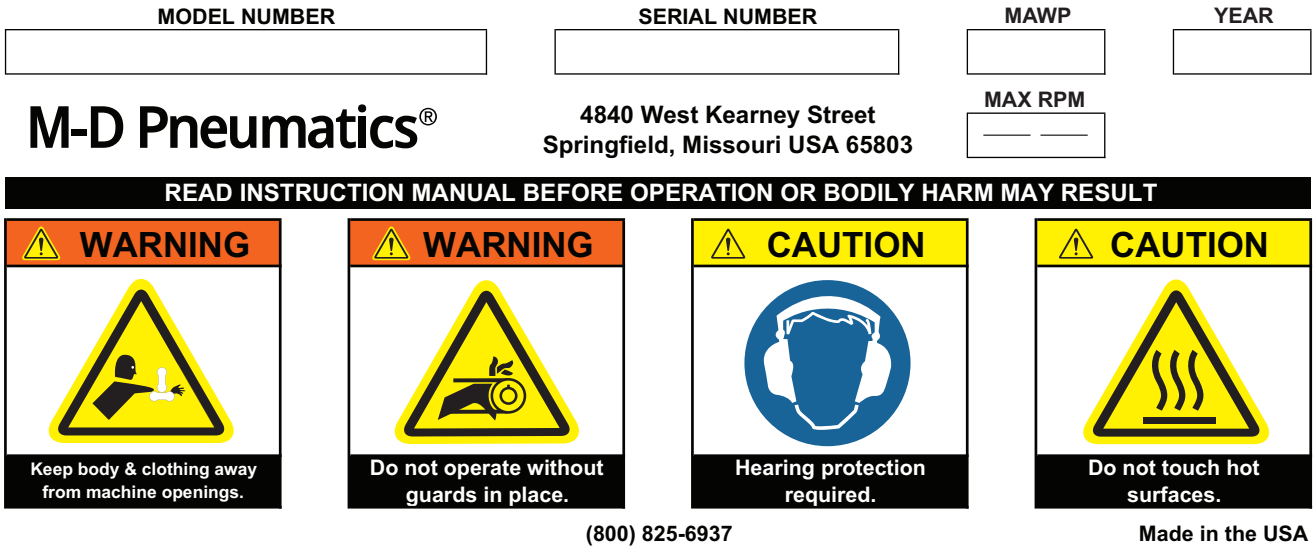


Figure 2-1 – General Operation and Symbols on Data Plate

The following information is contained on the data plate:

⚠ WARNING

Keep body and clothing away from machine.

During operation, keep body and clothing away from inlet and outlet of the blower.

⚠ WARNING

Do not operate without guards in place.

⚠ CAUTION

Hearing protection is required while the blower is in operation. Noise levels may reach as high as 81 dBA.

⚠ CAUTION

Do not touch hot surfaces.

The upper limit of the blower operation is 445°F (229°C). Do not touch the blower while it is in operation and assure blower is cool when not in operation.

MODEL NUMBER: The specific model of the blower

SERIAL NUMBER: Unique to each blower

YEAR: Year of manufacture

MAWP: Maximum Allowable Working Pressure

The standard MAWP is per ***Table 4-2 on page 9***. The MAWP shall not be exceeded.

03 LIFTING

⚠ WARNING

The blower must be handled using an appropriate device such as a fork truck or other appropriate lifting device. *See Table 4-1 on page 8* for approximate weights. Care should be taken to assure blower does not over-turn during handling and installation.

04

DESCRIPTION

NOTICE

Refer to specific data sheets for flow capacities and vacuum capacities.

NOTE: Refer to diagrams in this manual for proper rotation and orientation in inlet and discharge.

M-D Pneumatics Equalizer DF and Equalizer RM rotary lobe blowers are positive displacement type blowers, whose pumping capacity is determined by size, operating speed, and differential pressure conditions. Blowers employ rotors rotating in opposite directions within a housing closed at the ends by end plates.

The inlet to the discharge is sealed with operating clearances that are very small. Internal lubrication is not needed, as there is no moving contact.

Clearances between the rotors during rotation are maintained by a pair of accurately machined helical timing gears, mounted on the two shafts extended outside the air chamber. The intermeshing rotary lobes are designed to rotate and trap air or gas between each rotor and the housing. As the rotor lobes rotate past the edge of the suction port, the trapped air or gas is essentially at suction pressure and temperature. Since the blower is a constant volume device, the trapped air remains at suction pressure until the leading rotor lobe opens into the discharge port. The close clearances between the rotors inhibit back slippage of the trapped volume from between the rotors, and the trapped volume is forced into the discharge piping. Compression occurs not internal to the blower but by the amount of restriction, either downstream of the blower discharge port or upstream of the blower inlet port.

Figure 4-1 illustrates the air movement within the machine. In addition, the machine can operate in either direction.

Protect the blowers with cut-in switches or with bypass valving to limit differential pressure across the blower. ***See Table 4-2 on page 9*** for more information. When a belt drive is used, it is possible to adjust blower speed to obtain the desired capacity by changing the diameter of one or both sheaves, or by using a variable-speed motor pulley.

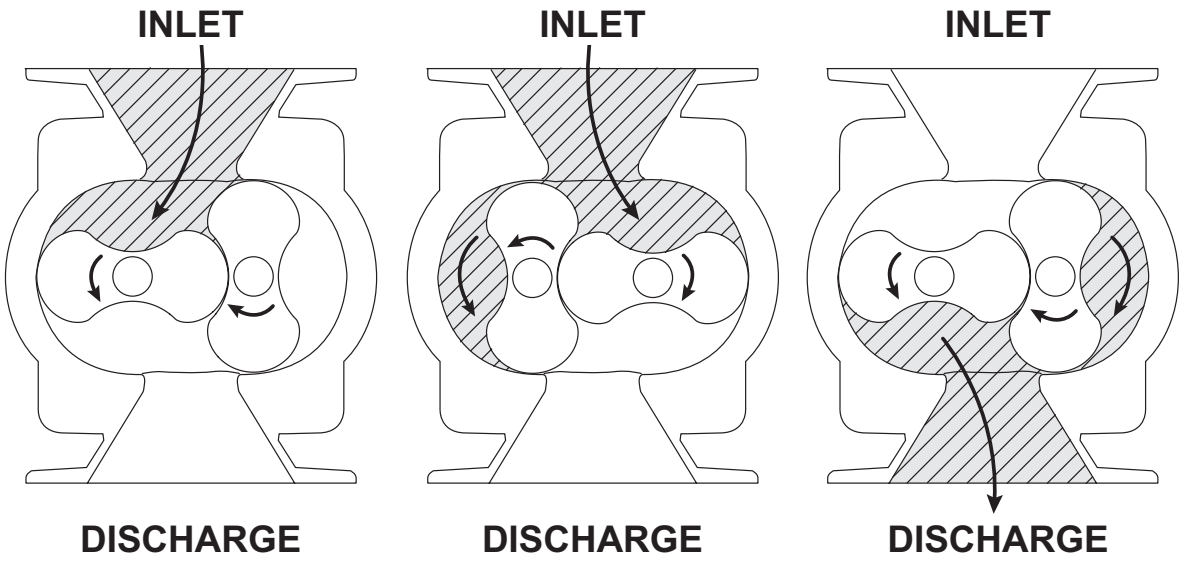


Figure 4-1 – General Operation Principle

FLOW BY DIRECTION

⚠ WARNING

Refer to diagrams in this manual for proper rotation and orientation in inlet and discharge.

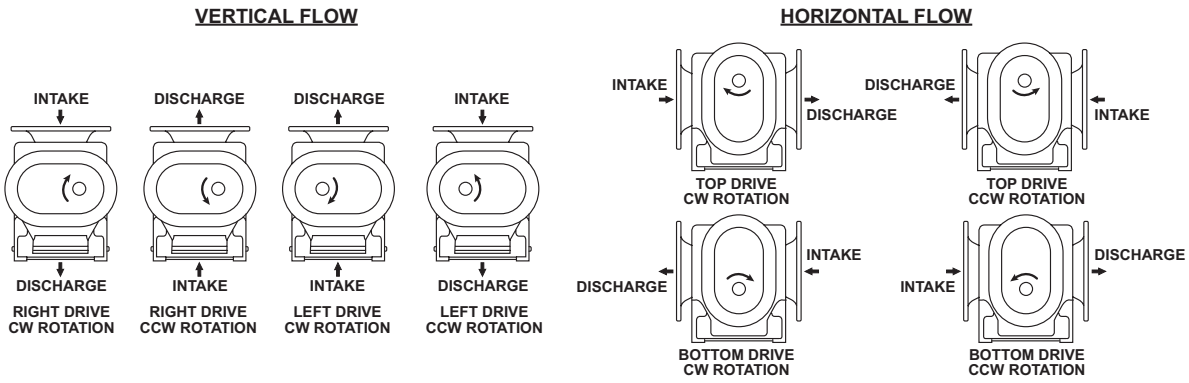


Figure 4-2 – Flow Direction by Rotation

SPECIFICATIONS

MODEL	APPROXIMATE OIL CAPACITY				PORT SIZE	MAXIMUM RPM	APPROXIMATE WEIGHT
	VERTICAL FLOW		HORIZONTAL FLOW				
	GEAR END	DRIVE END	GEAR END	DRIVE END			
4504	32.0 oz (0.95 mL)	23.0 oz (0.68 mL)	16 oz (0.47 mL)	13.0 oz (0.38 mL)	SOLD SEPERATELY	4,000	270 lb (122 kg)
4506	32.0 oz (0.95 mL)	23.0 oz (0.68 mL)	16 oz (0.47 mL)	13.0 oz (0.38 mL)		4,000	310 lb (141 kg)
4509	32.0 oz (0.95 mL)	23.0 oz (0.68 mL)	16 oz (0.47 mL)	13.0 oz (0.38 mL)		4,000	350 lb (159 kg)
4512	32.0 oz (0.95 mL)	23.0 oz (0.68 mL)	16 oz (0.47 mL)	13.0 oz (0.38 mL)		4,000	390 lb (177 kg)
4604	32.0 oz (0.95 mL)	17.0 oz (0.50 mL)	16 oz (0.47 mL)	11.0 oz (0.33 mL)	4 in. (102 mm)	4,000	210 lb (95 kg)
4606	32.0 oz (0.95 mL)	17.0 oz (0.50 mL)	16 oz (0.47 mL)	11.0 oz (0.33 mL)	4 in. (102 mm)	4,000	245 lb (111 kg)
4609	32.0 oz (0.95 mL)	17.0 oz (0.50 mL)	16 oz (0.47 mL)	11.0 oz (0.33 mL)	4 in. (102 mm)	4,000	280 lb (127 kg)
4612	32.0 oz (0.95 mL)	17.0 oz (0.50 mL)	16 oz (0.47 mL)	11.0 oz (0.33 mL)	6 in. (152 mm)	4,000	320 lb (145 kg)
6012	57.0 oz (1.69 mL)	41.0 oz (1.21 mL)	34 oz (1.01 mL)	22.0 oz (0.65 mL)	8 in. (203 mm)	3,000	590 lb (268 kg)
6016	57.0 oz (1.69 mL)	41.0 oz (1.21 mL)	34 oz (1.01 mL)	22.0 oz (0.65 mL)	8 in. (203 mm)	3,000	650 lb (295 kg)
6024	57.0 oz (1.69 mL)	41.0 oz (1.21 mL)	34 oz (1.01 mL)	22.0 oz (0.65 mL)	10 in. (254 mm)	3,000	775 lb (352 kg)

Table 4-1 – Specifications

MODEL	MAXIMUM RPM	MAXIMUM PRESSURE DIFFERENTIAL	MAXIMUM VACUUM	MAXIMUM TEMPERATURE RISE	MAWP
4504	4,000	18 psi (1,241 mbar)	16 inch-Hg (542 mbar)	290°F (161°C)	20 psi (1,379 bar)
4506	4,000	18 psi (1,241 mbar)	16 inch-Hg (542 mbar)	265°F (147°C)	20 psi (1,379 bar)
4509	4,000	18 psi (1,241 mbar)	16 inch-Hg (542 mbar)	260°F (144°C)	20 psi (1,379 bar)
4512	4,000	15 psi (1,034 mbar)	16 inch-Hg (542 mbar)	255°F (142°C)	20 psi (1,379 bar)
4604	4,000	18 psi (1,241 mbar)	16 inch-Hg (542 mbar)	290°F (161°C)	20 psi (1,379 bar)
4606	4,000	18 psi (1,241 mbar)	16 inch-Hg (542 mbar)	265°F (147°C)	20 psi (1,379 bar)
4609	4,000	18 psi (1,241 mbar)	16 inch-Hg (542 mbar)	260°F (144°C)	20 psi (1,379 bar)
4612	4,000	15 psi (1,034 mbar)	16 inch-Hg (542 mbar)	255°F (142°C)	20 psi (1,379 bar)
6012	3,000	15 psi (1,034 mbar)	16 inch-Hg (542 mbar)	280°F (156°C)	20 psi (1,379 bar)
6016	3,000	15 psi (1,034 mbar)	16 inch-Hg (542 mbar)	280°F (156°C)	20 psi (1,379 bar)
6024	3,000	10 psi (690 mbar)	16 inch-Hg (542 mbar)	230°F (128°C)	20 psi (1,379 bar)

Table 4-2 – Maximum Operating Limits

⚠ WARNING

The maximum pressure differential is based on the difference between the inlet pressure and the outlet pressure. The maximum pressure differential shall not be exceeded. Exceeding the maximum pressure differential will cause serious damage to the equipment and could cause bodily injury.

⚠ WARNING

The maximum allowable working pressure (MAWP) is based on the absolute pressure of the blower housing and is NOT the maximum allowable pressure differential. Exceeding the MAWP will cause serious damage to the equipment and could cause bodily injury.

To permit continued satisfactory performance, a blower must be operated within certain approved limiting conditions. The manufacturer's warranty is, of course, also contingent on such operation.

Maximum limits for pressure, temperature, and speed are specified in ***Table 4-2 on Page 9*** for various blower sizes when operated under the standard atmospheric conditions. Do not exceed any of these limits.

NOTICE

Specially ordered blowers with nonstandard construction, or with rotor end clearances greater than shown within the Assembly Clearances table, will not have the operating limits specified here. Contact your M-D Pneumatics sales representative for specific information.

NOTICE

Special attention must be paid when a blower has a higher than standard ambient suction temperature. Special recommendations for operating parameters and/or additional cooling may be recommended. Consult the factory or local representative for appropriate information.

FLOW CONFIGURATIONS

- The EQUALIZER blowers can be shipped from the factory in a horizontal flow configuration. With horizontal flow, a bottom drive configuration is now available on 4500 EQUALIZER DF and 6000 Equalizer RM models.
- The EQUALIZER blowers can also be shipped from the factory in either left drive or right drive with vertical flow configuration.
- If the flow direction is changed, relocate the oil level sight glasses and breathers to the proper positions, as shown in ***Figure 4-3***.

NOTICE

Failure to change plug location will result in blower failure and void the product warranty.

SPECIAL NOTE REGARDING 4600 AND 6000 EQUALIZER RM MODELS

- Vertical flow 4600 and 6000 EQUALIZER RM blowers with either left or right drive can be converted to top drive. However, a left drive blower cannot be converted to right drive, and vice versa.
- Top drive 4600 and 6000 EQUALIZER RM blowers can be converted to left drive only. Either left or right drive blowers can be converted to top drive.

NOTICE

Unless specifically stated by the factory, never arrange the blower so that the flow direction is horizontal with bottom drive. This will result in blower failure and void the product warranty.

- Bottom drive can be converted to right drive only.
- Top drive can be converted to left drive only.

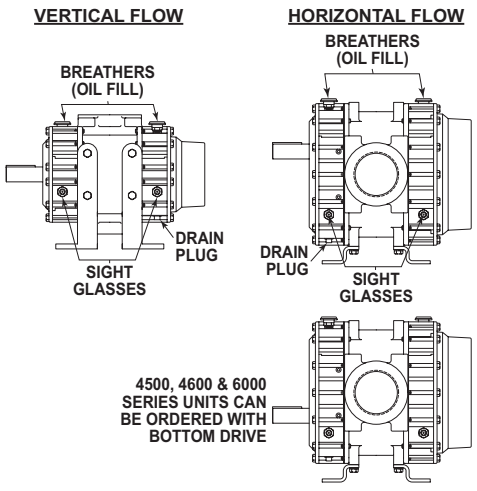


Figure 4-3 – Flow Configurations

05

INSTALLATION

GENERAL

⚠ DANGER

The blower is not intended to be used with explosive products or in explosive environments. The blower is not intended to be used in applications that include hazardous and toxic gases. Consult the factory for support.

⚠ DANGER

It is the responsibility of the installer to issue that proper guarding is in place and compliant with all applicable regulatory requirements.

⚠ WARNING

The bare shaft blower can generate excessive noise. Methods to reduce the noise levels by installing inlet and outlet silencers will be required. Even with inlet and outlet silencers, hearing protection will be required.

⚠ WARNING

Customers are warned to provide adequate protection, warning and safety equipment necessary to protect personnel against hazards in the installation and operation of this equipment in the system or facility.

⚠ WARNING

The standard MAWP is per *Table 4-2 on Page 9*. The MAWP shall not be exceeded unless specific factory testing of the pressure containing components of the blower has been performed.

⚠ WARNING

***Table 4-2 on Page 9* states the maximum operating speed in RPM (rotations per minute) and maximum temperature. Do not exceed these limits. The installation of the blower shall take these critical operating parameters into account and adequate control features implemented.**

⚠ WARNING

Upon completion of the installation, and before applying power, rotate the drive shaft by hand. It must move freely. If it does not, look for uneven mounting, piping strain, excessive belt tension or coupling misalignment or any other cause of binding. If blower is removed and still does not move freely, check inside the blower housing for foreign material.

NOTICE

Remove the protective covers from the shaft and inspect for damage.

Carefully check to ensure that no transit damage has been sustained. If damage has occurred from shipment, file a claim with the carrier immediately. Preserve the shipping container for inspection by the carrier.

NOTICE

In the event that your unit sustains damage while being shipped to your facility, do not return it to the factory without first obtaining shipping instructions from us.

Do not remove protective covers and plugs until the connections are complete. Mount the blower on a flat, level surface. Use a baseplate that is rigid, solidly supported, and structurally sound. Shim under the legs where necessary so that each leg of the blower supports an equal share of the blower weight. This is necessary to prevent twisting of the blower. Make sure the feet rest evenly on the mounting surface before fastening down. Twisting or cramping the blower during mounting will cause rotor contact and binding during operation, resulting in a condition called “soft foot.” ***See Soft Foot on page 14*** for further details and preventative measures.

A blower that is factory-mounted on a base should not require such adjustments. However, since the assembly can become twisted in shipping or installation, check for soft foot after installing the base. Shims may be needed for alignment. Loosen the foot hold-down screws to check foot contact with the mounting surface. Mount the base on a solid foundation or heavy flooring, using shims as necessary at bolting points to prevent warping the assembly.

Transmission of small operating vibrations to a support structure may be objectionable in some applications. Use of vibration isolators or vibration-absorbing materials can be effective in overcoming this transmission. To avoid causing distortion, apply the treatment under the common motor/blower base or mounting plate rather than directly under the feet alone.

Make sure piping is accurately squared with the blower and supported independently. Stress imparted from incorrectly aligned piping or mounting will create problems with bearing and seal life, possibly leading to premature internal contact. The blower should sit stress free and evenly on its supporting surface. Take care to evenly tighten the mounting bolts to avoid imparting undue stress into the blower. Stress can be checked in a free state with feeler stock or verified on a previously installed blower with the aid of a dial indicator. Spring or gap should be less than 0.002 in. (0.05 mm).

Use only clean, new pipe and make certain it is free of scale, cuttings, weld beads, dirt, or any other foreign material. To guard against damage to the blower, make sure that an inlet filter is used. Clean the filter of collected debris after 3 hours of operation and periodically thereafter. ***See Piping Connections on page 17*** for additional details.

Figure 5-1 shows a typical complete installation of the blower and accessories. Note the absence of throttle or shut-off valves in both discharge and intake piping. If it is possible for airflow to be cut off in either line, add a pressure and/or vacuum relief valve. In some installations, it may be desirable to use only an inlet silencer-cleaner supported directly from the blower connection. Keep the weight of accessories and piping to a minimum to prevent blower casing distortion. If the weight exceeds 10% of blower weight, support the components independently of the blower and connect them with a flexible hose or connectors. The approximate weight of the blower is listed in ***Table 4-1 on Page 8***.

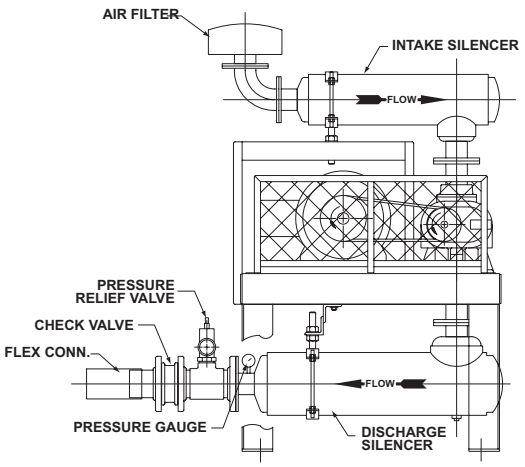


Figure 5-1 – Typical Blower Installation

A blower may be driven by direct-coupling to the driver or by V-belt drive for the purpose of obtaining other speeds within the approved range. ***See Motor Drives on page 18*** for more information.

Blowers from M-D Pneumatics are internally and externally treated after factory assembly and testing to protect against rusting in normal atmospheric conditions prior to installation. The maximum period of internal protection is considered to be 6 months under average conditions, provided closing plugs and seals are not removed. Protection against chemical or salt-water atmosphere is not provided. Avoid opening the blower until ready to begin installation, as protection will be quickly lost due to evaporation.

For recommended preparations for long-term storage (longer than 6 months), ***see Long-Term Storage on page 29.***

LOCATION

Install the blower in a room or outdoor area that supplies adequate space and lighting for routine maintenance. Make sure that indoor installation areas are well ventilated and kept as cool as possible, because operating the blower at elevated temperatures can result in nuisance overload or temperature shutdowns. An unprotected outdoor installation is satisfactory only when correct lubrication for the expected temperatures is provided. ***See Recommended Lubricants for Blowers and Vacuum Boosters on page 40.***

FOUNDATION

The blower does not need a special foundation. However, it does require a solid, level floor and adequate frame support. Bolt the blower system to the floor and seal any cracks.

BLOWER AIR INTAKE

To minimize maintenance, supply the blower with the cleanest air possible. The air must not contain any flammable or toxic gases, as the blower will concentrate these gases. This could result in damage to the blower and surrounding property and lead to personal injury or death. Do not block or restrict the opening of the blower, as the motor could overheat and fail.

Do not use blowers on explosive or hazardous gases. Do not exceed the limits described in ***Table 4-2 on Page 9*** on performance criteria such as pressure differential, running speed, and discharge temperature.

If it is necessary to take air from a remote source, such as in a vacuum application, make sure the diameter of the piping is at least equal to the diameter of the blower inlet. For distances greater than 20 ft (6 m), enlarge the pipe diameter to reduce inlet restriction. Excessive restriction will reduce the efficiency of the blower and elevate its discharge temperature. The piping used should also be corrosion-resistant and free of scale and dirt. Keep the inlet covered to keep out foreign objects and rain. Vacuum kits are available.

SOFT FOOT

Soft foot is a condition in which one of the blower feet does not sit flat on the base. Soft foot is usually due to irregularities in the surface to which the blower is mounted. When the bolt on the foot gets tightened, a slight distortion occurs that can affect bearing and seal life as well as internal contact between parts.

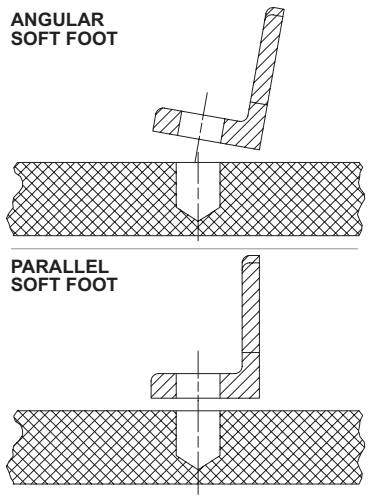


Figure 5-2 – Illustrations of Soft Foot

1. Place the blower on the base.
2. Check each foot for gaps between the foot and base (soft foot). Shim as necessary to fill the gap within 0.002 in. (0.05 mm).
   Figure 5-2 shows the two most common types of soft foot conditions. If either type is present at a measurement of more than 0.003 in. (0.076 mm), the blower may fail prematurely.
3. Tighten all bolts.
4. Mount a dial indicator on the base contacting one foot at 12 o'clock position.
5. Loosen the bolt on that foot. Observe indicator travel and add shims as needed to reduce "spring" to less than 0.002 in. (0.05 mm). Repeat steps 4 and 5 on the remaining feet.

SAFETY

M-D Pneumatics recommends the use of relief valves to protect against excessive pressure or vacuum conditions. Test these valves at initial start-up to be sure they are properly adjusted to relieve at or below the maximum pressure differential rating of the blower.

⚠ DANGER

It is the responsibility of the installer to assure that proper guarding is in place and compliant with all applicable regulatory requirements.

⚠ DANGER

Internal and external rotating parts of the blower and driving equipment can produce serious physical injuries. The blower should never be run with the inlet or discharge piping removed. If it becomes necessary to inspect the rotating parts of the blower or to change V-belts, be absolutely sure that all power to the motor controls has been shut off, the motor controls are locked out, and properly tagged before proceeding.

⚠ DANGER

Assure that properly sized vacuum breaks/ relief valves are used on the inlet side of the blower. Also assure that properly sized pressure relief valves are used on the outlet of the blower. The sizing shall be such to assure that the proper flow can be achieved without exceeding the rated vacuum and pressure ratings.

⚠ DANGER

Blower housing and associated piping or accessories may become hot enough to cause major skin burns on contact.

⚠ WARNING

Use lock out/tag out procedures to disable the electrical energy source before any service or work is done on the blower.

⚠ WARNING

Avoid extended exposure in close proximity to machinery with high intensity noise levels. Wear adequate ear protection.

NOTE: Use proper care and good procedures in handling, lifting, installing, operating, and maintaining the equipment

LUBRICATION

Every blower from M-D Pneumatics is factory-tested, oil-drained, and shipped dry to its installation point. Fill both independent oil reservoirs to the proper level before operation. Oil reservoirs are under the vacuum.

Shaft bearings at the gear end of the blower are splash-lubricated by one or both gears dipping into an oil reservoir formed in the gear end plate and cover. Shaft bearings at the drive end of the blower are lubricated by a slinger assembly dipping into an oil reservoir. Before starting the blower, fill the oil sumps as described in ***Filling Procedure on page 16***.

Add oil to the blower in the quantity listed in ***Table 4-1 on Page 8***. Make sure oil level is maintained within the notched area of the sight glass. ***See Figure 5-3***. Lower drive blowers have “bull’s eye” type oil level gauges. Maintain oil levels at the center of the glass.

⚠ WARNING

Never attempt to change or add lubrication while the blower is running. Failure to heed this warning could result in damage to the equipment or personal injury. Oil must be checked when the blower is NOT running.

⚠ WARNING

Properly dispose of the spent lubricants. Refer to the manufacturer of the lubricant and any regulations to assure proper and safe disposal.

⚠ WARNING

Do not start the blower until you are sure oil has been put in the gear housing and rear cover. Operation of the blower without proper lubrication will cause the blower to fail and void the warranty.

NOTICE

Assure oil is compatible with copper/yellow metals (if equipped with cooling coils).

NOTICE

***See Table 4-1** for oil capacities.*

Filling Procedure

***See Figure 5-3**. **See Recommended Lubricants on page 40** for suggested lubricants and grease.

1. Remove the fill plugs or breathers from both gear end and drive end plates.
2. Slowly pour oil through the fill until oil appears in the oil sight glass. Bring the oil level to the center of the sight glass.
3. Verify oil level is at proper level in both gear end and drive end sight glasses.
4. Replace the fill plugs or breathers that were removed in step 1.

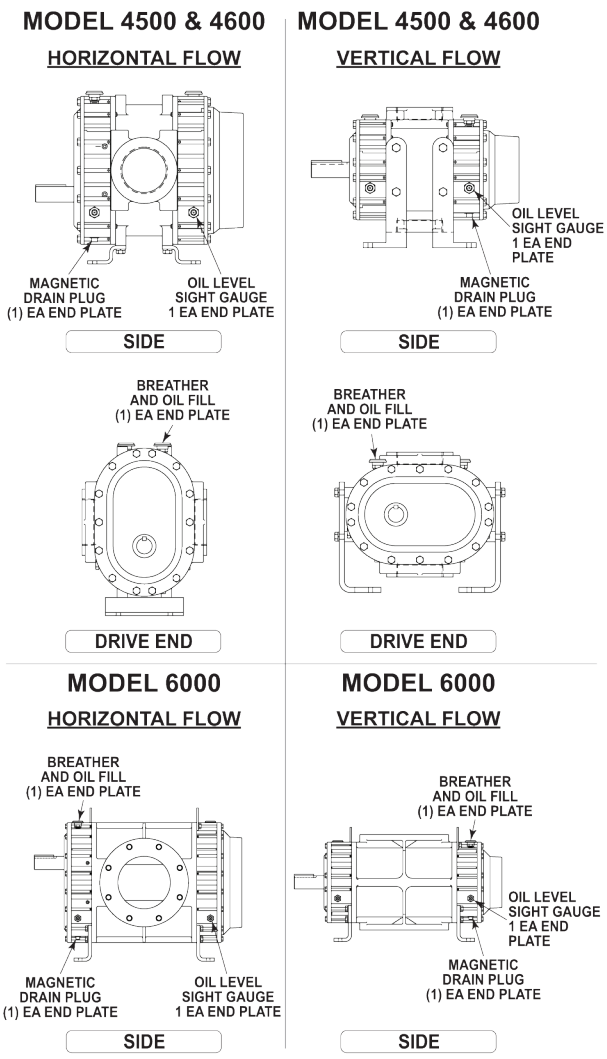


Figure 5-3 – Oil Fill, Drain and Level Plugs, and Level Gauges

FREQUENTLY ASKED QUESTIONS REGARDING LUBRICATION

What is the functional detriment if the "wrong oil" is used?

The lubricant is selected based on bearing speed, gear speed, and operating temperature. If the lubricant is too light, it increases wear by not separating the sliding surfaces and it will not remove the heat adequately. If the lubricant is too thick, the drag in the bearings is increased, causing them to run hotter. Thicker lubricant will not flow as readily into the gears and it will reduce the available backlash. Lubricants at our conditions are incompressible.

What is the functional detriment if the oil is not serviced?

If the lubricant is not serviced at the proper interval, the shearing action in the bearing and the gears will begin to take its toll and the lubricant will thicken. The blower will run hotter and the wear on moving parts will increase. The lubricant will generally appear dirtier, caused by material rubbing off the components. The lubricant will discolor because of overheating. An indicator of the breakdown of a lubricant is the increase in the Total Acid Number (TAN) and a change of 10 percent in the base viscosity.

Several things are happening as the lubricant goes through the blower. First, it is absorbing frictional energy in the form of heat. This heat has to be dissipated through either surface contact with cooler materials or in a rest volume of lubricant. While reducing the friction, the lubricant is also going through a shearing process and the molecular structure is broken down.

The result is that the lubricant will begin to thicken because of the shorter molecular chains and the drop out of additive packages. The thickened lubricant will cause more drag, increasing the friction and heat and further degrading the lubricant.

Operation of the blower (environment, run time, speed, and pressure) has a direct effect on duty cycles. The published cycles are based on worst-case conditions.

Hazards Associated With Breakdown or Ignition of Lubrication

⚠ DANGER

There is a risk associated with the lubrication media breaking down and resulting in a hazardous fluid or vapor. There may also be a hazard associated with the ignition of the lubrication media. Refer to the lubrication manufacturer's applicable instruction for safety precautions.

PIPING CONNECTIONS

⚠ WARNING

Pipe loading on the blower should be negligible as pipe loading can cause distortion of the blower. Use proper supports and pipe hangers to assure that there is no loading.

⚠ CAUTION

If the blower is to be located outdoors or in a building where the temperature surrounding the blower or the water supply and return piping can fall below 35°F (2°C), then care must be taken to ensure that the water (or other cooling liquid) does not freeze and cause damage. Heat exchanger and cooling lines must be drained of liquid during downtime unless a recirculating unit using a glycol mixture has been installed.

NOTICE

Units are never shipped from the manufacturer with liquid in the heat exchanger or cooling lines.

NOTICE

Remove the protective covers from the inlet and outlet ports and inspect for dirt and foreign material.

Inlet and outlet connections on all blowers are large enough to handle maximum volume with minimum friction loss. Maintain same-diameter piping. Do not support silencers by the blower. Avoid stress loads and bending moments.

Be certain all piping is clean internally before connecting to the blower. Place a 16-mesh wire screen backed with hardware cloth at or near the inlet connections for the first 50 hours of use until the system is clean. Clean the screen after 3 hours of operation and completely discard it once the system is clean, as it will eventually deteriorate and small pieces going into the blower can cause serious damage. A horizontal or vertical airflow piping configuration is easily achieved by rearranging the mounting feet position.

Hazards Associated With Hazardous Process Fluids

⚠ DANGER

It shall be the responsibility of the installer to ensure that piping is adequate, sealing between pipe joints is adequate for the process fluids and proper process and pressure protection devices are in place. It is also the responsibility of the installer to assure that process gasses are not vented in a manner that would be hazardous.

Refer to the manufacturer of the process media to assure that proper safety precautions are in place.

Blockage or Restriction

⚠ WARNING

Damage to the blower could occur if there is blockage in the inlet or outlet ports or piping. Care should be taken when installing the blower to assure that there are no foreign objects or restrictions in the ports or piping.

MOTOR DRIVES

Two drive connections commonly used are direct drive and V-belt drive.

Direct Coupled

When installing the motor directly to the blower, align the shafts to the coupling according to the coupling manufacturer's instructions. Blowers shipped with the motor directly coupled and mounted on a common base have been aligned prior to shipment. Further alignment is not normally necessary, but be sure to check the alignment and make adjustments if necessary prior to starting the blower.

Coupling halves must correctly fit the blower and drive shafts so that only light tapping is required to install each half. The two shafts must be accurately aligned. A direct-coupled blower and motor must be aligned with the two shafts having no more than 0.005 in. (13 mm) Total Indicator Reading (TIR). Make sure the face is aligned within 0.002 in. (0.05 mm).

Establish proper gap between coupling halves according to the coupling manufacturer's instructions with the motor armature. Proper gap will minimize the chance for end thrust on the blower shaft. Re-align and grease all direct-coupled base-mounted blowers after field installation.

V-Belts

If the motor and blower are V-belt connected, the sheaves on both the motor and blower shafts should be as close to the shaft bearings as possible. Blower sheave is not more than 1/4 in. (6.5 mm) from the blower drive end cover. The drive sheave is as close to the driver bearing as possible. Take care when installing sheaves on the blower and motor shafts. Make sure the face is accurately in line to minimize belt wear.

Adjust the belt tension to the manufacturer's specifications using a belt tension tester. Check new belts for proper tension after 24 hours of run time. When manufacturer data is not available, industry guidelines recommend 1/64 in. deflection for each inch of span (0.157 mm deflection per centimeter of span) at 8 – 10 lb (3.6 – 4.5 kg) of force in the center of the belt.

Insufficient tensioning is often indicated by slipping (squealing) at start-up. Do not use belt dressing on V-belts. Keep sheaves and V-belts free of oil and grease. Remove tension from belts if the drive is to be inactive for an extended period of time. For more specific information, consult the drive manufacturer. In a V-belt drive, the blower sheave must fit its shaft accurately, run true, and be mounted as close to the bearing housing as possible to minimize bearing loads.

A tight or driving fit will force the drive shaft out of its normal position and cause internal damage. A loose fit will result in shaft damage or breaking. Make sure the motor sheave fits correctly and is properly aligned with the blower sheave.

Adjust the motor position on its sliding base so that belt tension is in accordance with drive manufacturer's instructions. Always avoid excessive belt tension. Recheck tension after the first 10 hours of operation and periodically thereafter to avoid slippage and loss of blower speed.

Check the blower after installation and before applying power by rotating the drive shaft by hand.

If the drive shaft does not rotate freely:

- Look for uneven mounting, piping strain, excessive belt tension, or coupling misalignment
- Check the blower to make sure oil was added to the reservoirs

Setting V-Belt Tension

Proper belt tension is essential to long blower life. ***Figure 5-4***, ***Figure 5-5***, and the following procedure are provided to aid in field-adjusting V-belts (when the blower is so equipped) for maximum performance. A visual inspection of the V-belt drive should yield the appearance shown in ***Figure 5-4***.

Factors outside the control of the belt tensioning system used on an individual blower package assembly, such as environmental factors and quality of the belts installed, may contribute to decreased belt life. Such factors can cause wear of the belts beyond the ability of the tensioning system to compensate.

As such, it is recommended to check belt tension monthly and make any manual adjustments found necessary.

1. Turn off and lock out power.
2. Remove the belt guard fasteners (if equipped).
3. Remove the belt guard.
4. Check and adjust the belt tension as necessary. Tension should be 1/64 in. deflection per inch of span (0.157 mm deflection per centimeter of span) between sheaves, with 8 – 10 lb (3.6 – 4.5 kg) force applied at the center point of the top section of belt.
5. Install the belt guard, making sure that all drive components are free of contact with the guard.
6. Install the belt guard fasteners that were removed in step 2.
7. Unlock the power and start the blower.
8. Resume normal operation.

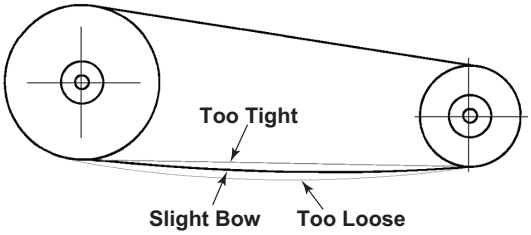


Figure 5-4 – General Appearance of a V-belt Drive

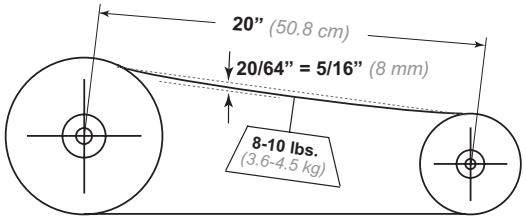


Figure 5-5 – Setting of Proper Tension for a V-belt Drive

V-Belt Troubleshooting

PROBLEM	POSSIBLE CAUSES	SOLUTION
Belts slip (sidewalls glazed)	Not enough tension	Replace belts; apply proper tension.
Drive squeals	Shock load	Apply proper tension.
	Not enough arc of contact	Increase center distance.
	Heavy starting load	Increase belt tension.
Belt(s) turned over	Broken cord caused by prying on sheave	Replace set of belts and install correctly.
	Overloaded drive	Redesign drive.
	Impulse loads	Apply proper tension.
	Misalignment of sheave and shaft	Re-align drive.
	Worn sheave grooves	Replace sheaves.
	Excessive belt vibration	Check drive design. Check equipment for solid mounting. Consider use of banded belts.
Mismatched belts	New belts installed with old belts	Replace belts in matched sets only.
Breakage of belt(s)	Shock loads	Apply proper tension; recheck drive.
	Heavy starting loads	Apply proper tension; recheck drive. Use compensator starting.
	Belt pried over sheaves	Replace set of belts correctly.
	Foreign objects in drives	Provide drive guard.
Rapid belt wear	Sheave grooves worn	Replace sheaves.
	Sheave diameter too small	Redesign drive.
	Mismatched belts	Replace with matched belts.
	Drive overloaded	Redesign drive.
	Belt slips	Increase tension.
	Sheaves misaligned	Align sheaves.
	Oil or heat condition	Eliminate oil. Ventilate drive.

MOTOR AND ELECTRICAL CONNECTIONS

⚠ WARNING

The motor and connections shall be protected to assure that product and environmental condensation does not come in contact with the electrical connections.

NOTICE

It is the responsibility of the installer to assure that the motor is in compliance with the latest edition of IEC 60204-1 and all electrical connections performed per IEC 60204-1, this includes over current protection.

Wire the motor and other electrical devices, such as solenoid valves and temperature switch, to the proper voltage and amperage as indicated on the nameplate of the component being wired. Turn the blower by hand after wiring is completed to determine that there are no obstructions and that the blower turns freely. Then, momentarily start the blower to check the direction of rotation.

Figure 4-2 shows direction of airflow in relation to rotor rotation. The airflow direction can be reversed by reversing the appropriate motor leads.

06

OPERATION

GENERAL

⚠ DANGER

The blower is not intended to be used with explosive products or in explosive environments. The blower is not intended to be used in applications that include hazardous and toxic gases. Consult the factory for support.

⚠ WARNING

Do not operate without guards in place.

⚠ WARNING

Maximum operating speed: *Table 4-2 on page 9* states the maximum operating speed in RPM (rotations per minute), the maximum pressure differential, maximum vacuum and maximum temperature rise. Do not exceed these limits.

Before starting the blower for the first time under power, recheck the installation thoroughly to reduce the likelihood of difficulties. Use the following checklist as a guide, but consider any other special conditions in your installation.

1. Be certain no bolts, rags, or dirt have been left in blower.
2. Be certain that inlet piping is free of debris. If an open outdoor air intake is used, be sure the opening is clean and protected by an inlet filter. This also applies to indoor use.
3. If installation is not recent, check blower leveling, drive alignment, belt tension, and tightness of all mounting bolts.
4. Be certain the proper volume of oil is in the oil reservoir chambers.
5. Be certain the driving motor is properly lubricated and connected through suitable electrical overload devices.
6. With electrical power off and locked out to prevent accidental starting, rotate the blower shaft several times by hand to make sure the blower is rotating freely. Unevenness or tight spots are indicators of a condition that should be corrected before progressing.
7. Check motor rotation by momentarily pushing the START button and then checking the flow direction of the blower. Reverse the motor connections if the flow is in the wrong direction.

Carry out initial operation under “no load” conditions by opening all valves and venting the discharge to the atmosphere, if possible. Then, start the motor briefly, listen for unusual noises, and make sure the blower coasts freely to a stop. If no problem appears, repeat this check and let the motor run slightly longer. If any questions exist, investigate before proceeding.

Assuming all tests are satisfactory, the blower will now be ready for continuous full-load operation. During the first several days, check periodically to make sure all conditions remain acceptable and steady. These checks may be particularly important if the blower is part of a process system where conditions may vary. At the first opportunity, stop the blower and clean or remove the inlet filter. Also recheck leveling, coupling alignment or belt tension, and mounting bolts for tightness

START-UP CHECKLIST

M-D Pneumatics recommends that these start-up procedures be followed in sequence and checked off (☑) in the boxes provided in any of the following cases.

• During initial installation • After any shutdown period	• After maintenance work has been performed • After blower has been moved to a new location

DATES CHECKED:				
☐☐☐☐	Check the unit for proper lubrication. Proper oil level is critical. ***See Lubrication on page 15***. ***See Recommended Lubricants on page 40*** for information on acceptable lubricants for the product.			
☐☐☐☐	Check the V-belt drive for proper belt alignment and tension.			
☐☐☐☐	Carefully turn the rotors by hand to be certain they do not bind.			

⚠ WARNING

Disconnect power. Make certain power is off and locked out before touching any rotating element of the blower, motor, or drive components.

☐☐☐☐	“Bump” the unit with the motor to check rotation (counterclockwise when facing the shaft) and to be certain it turns freely and smoothly.
☐☐☐☐	Start the unit and operate it for 30 minutes at no load. During this time, feel the cylinder for hot spots. If minor hot spots occur***.***
☐☐☐☐	Apply the load and observe the operation of the blower for 1 hour.
☐☐☐☐	If minor malfunctions occur, discontinue operation and ***see Troubleshooting on page 36***.

OPERATING

The upper temperature limit for blower operation is measured in the exhaust gas stream with a low-mass thermocouple. When this temperature limit switch is installed, as the temperature exceeds the predetermined temperature, the blower motor will stop and cannot be restarted until the temperature drops below the trip setting of the temperature switch.

⚠ DANGER

The blower is not intended to be used with explosive products or in explosive environments. The blower is not intended to be used in applications that include hazardous and toxic gases. Consult the factory for support.

⚠ WARNING

The blower can generate excessive noise. Hearing protection is required while the unit is in operation.

⚠ WARNING

Physical harm may occur if human body parts are in contact or exposed to the process vacuum. Assure that all connections are protected from human contact.

⚠ WARNING

If rated vacuum or pressure levels are exceeded, process fluids will migrate to other parts of the blower and system.

⚠ CAUTION

Do not touch hot surfaces.

The upper limit of the blower operation is 445° F (229° C). Do not touch the blower while it is in operation and assure blower is cool when not in operation.

⚠ CAUTION

Use of a thermowell insulates the thermocouple. Invalid and delayed readings will result. This can result in ineffective protection devices.

NOTICE

The upper temperature limits are not intended for continuous operation. Consult with factory for detailed information assistance.

STOPPING

⚠ CAUTION

Do not stop the blower if there are high outlet pressures in the outlet piping. Unload the outlet piping prior to shutting down the blower.

Stop the blower by turning off the motor. Isolate the blower from the vacuum system and vent the blower to atmosphere. Turn off the cooling water, if the blower is water cooled. Stop the backing pump. See the component instruction manual.

RECOMMENDED SHUTDOWN PROCEDURE TO MINIMIZE RISK OF FREEZING OR CORROSION

When an air piping system has high humidity or moisture, water condensation can occur after the blower is shut down and it begins to cool. Condensation creates an environment favorable to corrosion of the iron internal surfaces and to ice formation in cold weather. Both conditions can close the operating clearances, causing the blower to fail upon future start-up.

The following shutdown procedure minimizes the risk of moisture condensation, corrosion, and freezing.

NOTICE

Care must be taken so as not to overload or overheat the blower during this procedure.

1. Isolate the blower from the moist system piping, allowing the blower to intake atmospheric air. Operate the blower under a slight load, allowing the blower to heat within safe limits. The heat generated by the blower will quickly evaporate residual moisture.
2. For carpet cleaning applications, after the work is completed, allow the blower to run 3 – 5 minutes with the suction hose and wand attached. The suction hose and wand will provide enough load to the blower to evaporate the moisture quickly.
3. For extended shutdown, inject a small amount of a light lubricating oil such as 3-in-One® or a spray lubricant such as WD-40® into the inlet of the blower just before shutdown *(3-in-One and WD-40 are registered trademarks of WD-40 Company)*. The lubricant will provide an excellent protective coating on the internal surfaces. If using a spray lubricant, take care to prevent the applicator tube from getting sucked into the blower. The applicator tube will damage the blower, likely to a degree where repair would be required.
4. If the blower is being taken out of commission for an extended period of time, ***see Long-Term Storage on page 29***.

07 MAINTENANCE

GENERAL

Regular inspection of the blower and its installation, along with complete checks on operating conditions, will pay dividends in added life and usefulness. Also, service the drive per the manufacturer's instructions and lubricate the coupling or check the belt drive tension.

⚠ DANGER

The blower and parts may contain hazardous media. Assure that pump and parts are evacuated of hazardous media prior to servicing.

⚠ CAUTION

The electrical service must be isolated and de-energized prior to maintenance. Apply appropriate procedures to assure electrical supply is de-energized and cannot be inadvertently energized during maintenance.

Assure piping and product is isolated prior to maintenance of blower. Apply appropriate procedures to assure piping and product is isolated and that inadvertent opening of valves cannot occur during maintenance.

⚠ CAUTION

During routine maintenance, inspect and assure that guards are in place and secure.

Pay special attention to lubrication of timing gears and bearings according to the information in ***Lubrication on page 15***.

When a blower is taken out of service, it may require internal protection against rusting or corrosion. The need for such protection must be a matter of judgment based on existing conditions as well as length of downtime. Under atmospheric conditions producing rapid corrosion, protect the blower immediately. ***See Long-Term Storage on page 29***.

REGULAR MAINTENANCE

A well-designed maintenance program will add years of service to the blower.

Check a newly installed blower frequently during the first month of operation, especially lubrication. With the blower at rest, check the oil level in both the gear (drive) end and free (non-drive) end of the blower and add oil as needed. Complete oil changes are recommended every 1,000 - 1,200 operating hours, or more frequently depending on the type of oil and operating temperature. Also change the oil more frequently if pumping corrosive vapors or where excessive operating temperatures are encountered. The following is recommended as a minimum maintenance program.

DAILY	WEEKLY	MONTHLY
1. Check and maintain oil level, and add oil as necessary. 2. Check for unusual noise or vibration (***See Troubleshooting on page 36***).	1. Clean all air filters. A clogged air filter can seriously affect the efficiency of the blower and cause overheating and oil usage. 2. Check the relief valve to make sure it is operating properly.	1. Inspect the entire system for leaks. 2. Inspect the condition of the oil and change if necessary. 3. Check drive belt tension and tighten if necessary.

NOTICE

Oil levels should be checked every 24 hours of operation.

Proper oil drain schedules require oil be changed before the contaminant load becomes so great that the lubricating function of the oil is impaired or heavy disposition of suspended contaminants occurs. To check the condition of the oil, drain a sample into a clean container and check for the presence of water or solids. Slight discoloration of the oil should not necessitate an oil change.

SPARE PARTS

Should adjustments or replacement be needed, repairs can often be performed locally as described in this manual after obtaining the required parts. Personnel should have a good background of mechanical experience and be thoroughly familiar with the procedures outlined in this manual. For major repairs not covered in this manual, contact the nearest M-D Pneumatics service representative.

When ordering parts, supply the blower nameplate information, as well as the item number and parts description as per the parts lists and assembly drawings. Repair kits are available for all models. These kits contain all the seals, bearings, O-rings, locks, and special retaining screws necessary for an overhaul. For convenience when ordering parts, complete the **Operating Data Form** included on the inside, back cover of this manual.

In developing a stock of spare parts, consider the following factors:

- The degree of importance in maintaining the blower in a “ready” condition
- The time lag in parts procurement
- Cost
- Shelf life (seals and O-rings)

FACTORY SERVICE AND REPAIR

With proper care, M-D Pneumatics blowers will give years of reliable service. The parts are machined to close tolerances and require special tools by mechanics who are skilled at this work. Should major repairs become necessary, contact the factory for the location of the nearest service facility.

NOTICE

Current regulations require Material Safety Data Sheet to be completed and forwarded to M-D Pneumatics on any unit being returned for any reason which has been handling or involved with hazardous gases or materials. This is for the protection of the employees of M-D Pneumatics who are required to perform service on this equipment. Failure to do so will result in service delays.

NOTICE

When returning a blower to the factory for repair, under warranty, please note the factory will not accept any unit that arrives without authorization. Contact Customer Service for return authorization.

LONG-TERM STORAGE

Any time the blower will be stored for an extended period of time, make sure it is protected from corrosion by following this procedure:

1. Spray the interior (lobes, housing, and end plates) with rust preventative. Repeat as conditions dictate and on an at least a yearly basis.
2. Fill both end covers completely full of oil.
3. Firmly attach a prominent tag stating that the end covers are full of oil and must be drained and refilled to proper levels before start-up.
4. Apply a rust-preventative grease to the drive shaft.
5. Spray all exposed surfaces, including the inlet and discharge flanges, with rust preventative.
6. Seal the inlet, discharge, and vent openings. It is not recommended that the blower be set in place, piped to the system, and allowed to remain idle for a prolonged amount of time. If any component is left open to the atmosphere, the rust preventative will escape and lose its effectiveness.
7. During storage, make sure the blower does not experience excessive vibration.
8. Attach a desiccant bag to one of the covers to prevent condensation from occurring inside the blower. Make sure any desiccant bag (or bags) is attached to the covers so that they will be removed before start-up of the blower.
9. Store the blower in an air conditioned and heated building if possible. If air conditioned and heated storage is not possible, make conditions as dry as possible.
10. If possible, rotate the drive shaft by hand at least monthly to prevent seals from setting in one position.

08

DISASSEMBLY AND REASSEMBLY

DISASSEMBLY & INSPECTION

With proper maintenance and lubrication, normal life expectancy for gears, bearings, and seals can be achieved. However, over time these parts must be repaired or replaced to maintain the efficiency of the blower. This section is written in a way that will allow you to completely disassemble the blower. The inspection of certain repairable or replaceable parts is referred to at the point of disassembly where these parts are exposed. If repair or replacement is deemed necessary at any point of inspection, appropriate instruction is given to achieve.

Remove the oil drain plugs in the bottom of the end covers and drain the oil. Remove eight cap screws and remove the gear cover. It may be necessary to tap the sides with a mallet or wooden block to break the seal joint.

Gears are not exposed for visual inspection.

- Broken teeth
- Chipped teeth
- Uneven wear
- Excessive wear
- Any other abnormalities

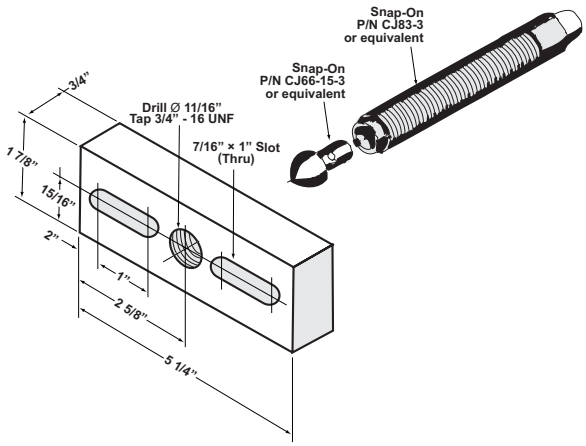


Figure 8-1 – Bar Puller

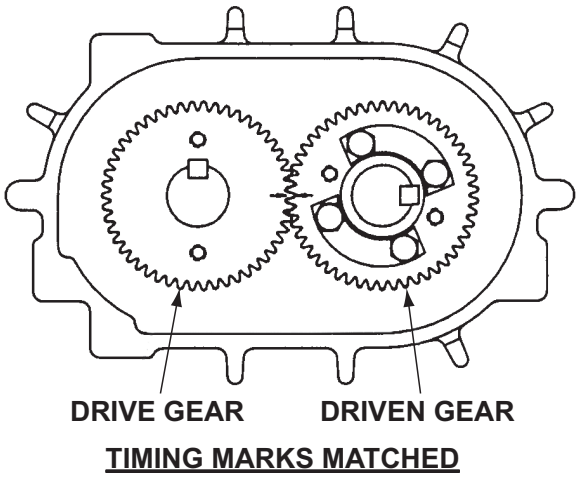
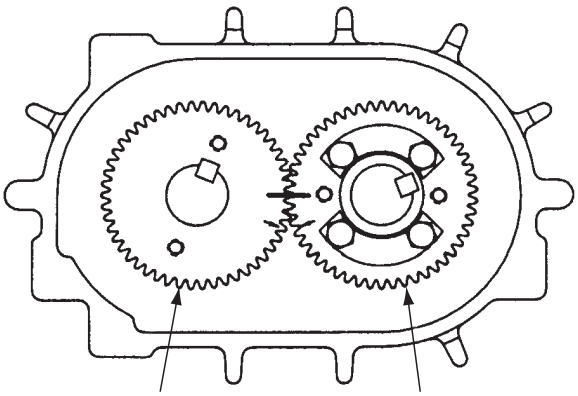


Figure 8-2 – Timing Marks Aligned



TIMING MARKS ADVANCED 3 TEETH
(Reference Marks Aligned)

Figure 8-3 – Timing Marks Advanced Three Teeth

⚠ WARNING

Before performing any repair or replacement, disconnect and lock out power.

DISASSEMBLY OF BLOWER

1. Remove the blower from the installation, and drain lubricant from both ends by removing the magnetic drain plugs. Mark the end plates, covers and housing so they can be reassembled in their original positions.
2. Remove the cap screws from the drive end cover. Use a beveled chisel and hammer to remove the cover.
3. Remove the cap screw, washer and oil slinger.
4. Remove the cap screw and bearing retainer plates. Note the location and sequence of the wave springs and spacers as they are removed.
5. Attach the bar pullers as shown in ***Figure 8-1*** to each bearing bore and pull end plate.
6. Remove the cap screws and gear end cover.
7. Remove the gear lock bolts and washers.
8. Align the timing marks on the gears (***see Figure 8-3***). Rotate the drive gear clockwise approximately three teeth, and mark a matching reference line on each gear as shown in ***Figure 8-4***. This gear position is necessary so rotors will clear and not jam. Do not allow the gears to move from the matched reference line while pulling. Use a light rocking motion to make sure that the lobes have not jammed. Remove the driven gear first, and then remove the drive gear.

NOTICE

Failure to properly pull this gear could result in damage to rotor keyway or a bent rotor shaft. Never use excessive force.

9. Remove the cap screws and bearing retainer plates.
10. Use a bar puller attached to the bearing bore to push one rotor at a time from the end plate. Keep the rotor lobes in a vertical position while removing.
11. Using a mallet, tap the end plate from the housing.
12. Tap out the bearings and seals.
13. Remove the seal rings from the rotor shaft sleeves.
14. Inspect all parts for wear.

ASSEMBLY OF BLOWER

The assembly procedure is generally the same for all series, but notations are made where there are differences.

Dowel pins are used to locate the end plates, housing, and end covers in their proper locations relative to each other. Be sure the dowel pins are in place.

It is recommended that the gear end rotor shaft bearings be purchased from M-D Pneumatics, as they are specially ground to locate the rotors with correct end clearance relative to the gear end plate.

Make sure all parts are clean and free of any nicks or burrs caused by disassembly. ***See Special Tool Drawings on page 42*** for seal pressing tools as well as other assembly tools required.

M-D Pneumatics suggests that long feeler gauges (12 in. [250 mm]) be used to check the interlobe timing, preferably two 0.006 in. (0.15 mm), one 0.005 in. (0.13 mm), one 0.004 in. (0.10 mm), and one 0.003 in. (0.08 mm). This will produce all combinations from 0.003 in. (0.08 mm) to 0.021 in. (0.53 mm) and also 0.024 in. (0.61 mm), which is the total.

NOTICE

All cap screws used on EQUALIZER™ models are metric. The use of anything other than metric cap screws will result in thread damage. All pipe plug and oil breather holes are National Pipe Thread (NPT).

Preparation of End Plates and Rotors for Assembly

1. Apply a thin coat of sealer to the O.D. of the lip seal, and press into seal bores of both end plates. Make sure the seals are fully seated without deforming. The seal lip should face up toward the bearing. Lubricate the lip with grease.

   All models except 6000: If the rotor shaft sleeves are being replaced, lubricate the shaft and press on new sleeves with inside chamfer facing lobes (O.D. chamfer faces outward). Install the seal rings into the grooves of the rotor shaft sleeves on the gear end only, and lock in place by compressing the ring. Center the rings on the sleeves. The seal rings for the drive end of the shafts will be installed later in the assembly procedure.

NOTICE

All rotor sleeves or seal journals MUST be polished to remove any scratches or nicks. Failure to polish seal journals could result in seal leakage.

Gear End Assembly

2. Stand the rotors on a press with the drive rotor on the left, making sure the keyways are properly positioned as shown in ***Figure 8-4***. You may use the drive end plate as a temporary fixture to support the rotor lobes while pressing on the bearings and gears.

3. Install the gear end plate over the rotor shafts, making sure the oil feed holes for the bearing bores are properly located in relation to the drive rotor.

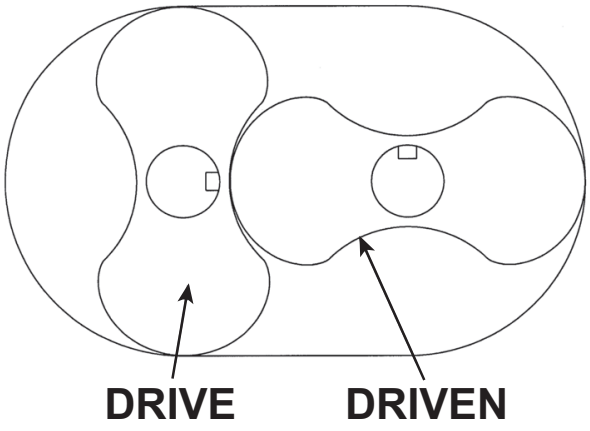


Figure 8-4 – Keyway Position

NOTE: Two oil feed holes for each bearing bore must always be at the top when the assembled unit is standing on its feet. Units can only be assembled for top drive, left drive, or right drive.

The seal rings should glide into their respective bores with ease.

4. Lubricate the shafts and press the double row ball bearings onto the shafts and into the end plate bores. Use the bearing pressing tool shown in ***Special Tool Drawings on page 42***.

⚠ CAUTION

These bearings have flush ground faces and should be installed with manufacturer numbers up (toward gear). If no numbers appear on either side, look for a black dot (acid mark) on the inner race. Install with dot up. Do not use bearings that have not been flush ground to within a .001" (.025 mm) tolerance.

5. Install the bearing retainer rings and secure with cap screws. At this time, use feeler gauges to check the clearance between the face of the end plate and the rotor lobes. ***See Parts List on page 44*** and ***Assembly Drawings on page 47*** for gear end clearance. If clearances are not within specifications, recheck the parts to find the cause of the incorrect clearances before proceeding.

6. Install the keys in the rotor shaft keyways. Tight fits are required.

7. Lubricate the shafts and keys, and press the drive gear (right hand helix) on the drive rotor. To install the driven gear, align the reference marks as shown in ***Figure 8-3***. Tap the gear with a mallet to start, and then press the gear until seated.

NOTE: All timing gears must be used in sets as they are matched and serially numbered.

8. Install the gear washers and secure with cap screws using a few drops of Loctite® 242 (removable Threadlocker) on each screw.

9. Remove the assembly from the press and stand it on a workbench with the gears down. Place blocks under the end plate to prevent the assembly from falling over. The drive gear should remain on the left side.

10. Install the rotor housing and secure temporarily with two cap screws evenly spaced.

11. Check clearances between the end of the lobes and housing using a flat bar and feeler gauges or a depth micrometer. ***See Parts List on page 44*** and ***Assembly Drawings on page 47*** for drive end clearances.

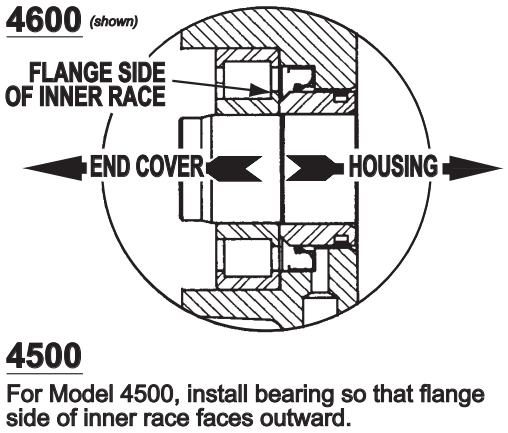


Figure 8-5 – Bearing Race

Drive End Assembly

12. Repeat step 3 and step 4 to assemble the drive end plate and temporarily secure with two cap screws evenly spaced.

NOTE: 4500 Models: Install free end spacers on shaft (Item 123)

13. Lubricate the shafts and install roller bearings on 4600 models. On 6000 models, the drive rotor bearing is a larger bearing than the driven rotor bearing.

NOTE: The inner races of all roller bearings have a flange on one side only. This flange must face inward (*see Figure 8-5*). For 4500 models, the inner race flange must face outward.

14. **4600 Models:** Install one wave spring on the drive rotor, and install two wave springs with spacer between on the driven rotor.

NOTE: 4500 models have no wave springs to install.

6000 Models: Install two wave springs with spacer between on both rotors.

Secure with the retainer plate and cap screws.

15. Install the spring pin in the driven rotor, oil slinger, and washer. Secure with cap screw.

16. Apply a thin coat of sealer to the O.D. of the drive shaft seal and press into the end cover bore. The lip must face inward.

17. Remove the temporary screws, and then place a bead of silicone sealer around the perimeter of the end plate. Carefully slide the cover over the drive shaft. Make sure the dowels are in place. Secure with cap screws. Lay the assembly down with the drive gear on the left for timing.

Adjusting Rotor Interlobe Clearance

18. The driven gear is made of two pieces. The outer gear shell is fastened to the inner hub with four cap screws and located with two dowel pins. A laminated shim, made up of 0.003 in. (0.076 mm) laminations, separates the hub and the shell. Removing or adding shim laminations moves the gear shell axially relative to the inner hub. Being a helical gear, it rotates as it is moved in or out and the driven rotor turns with it, thus changing the clearance between the rotor lobes. Changing the shim thickness 0.014 in. (0.36 mm) on a 6000 model will change the interlobe clearance approximately 0.005 in. (0.13 mm). On a 4600 model, it would take approximately 0.012 in. (0.30 mm) shims to produce the same change.

EXAMPLE: See Figure 8-6, check the clearance on a 6000 model at AA (right-hand reading) and BB (left-hand reading). If the AA reading is 0.017 in. (0.43 mm) and BB reading is 0.004 in. (0.10 mm), by removing 0.018 in. (0.46 mm) of shims, the readings should then read:
AA 0.011 in. (0.28 mm) and BB 0.010 in. (0.25 mm).

To determine the amount of shim to add or remove, subtract the smaller reading from the larger and multiply the result by:

1.2 for Model 4600: 0.017 − 0.004 = 0.013 in. (0.33 mm) × 1.2 = 0.0156 in. (0.396 mm) or 0.015 in. (0.38 mm)
1.4 for Model 6000: 0.017 − 0.004 = 0.013 in. (0.33 mm) × 1.4 = 0.0182 in. (0.462 mm) or 0.018 in. (0.46 mm)

Round off the amount the closest increment of shims available: 0.006 in., 0.009 in., 0.012 in., etc.

To determine whether to add or remove shim: If the right side reading is higher than the left side, remove this amount. If the right side reading is lower, then add this amount. When removing gear shell from the driven gear, it is not necessary to remove the gear lock bolt. After completing the timing of the lobes, bend over the lock tabs on the four gear cap screws.

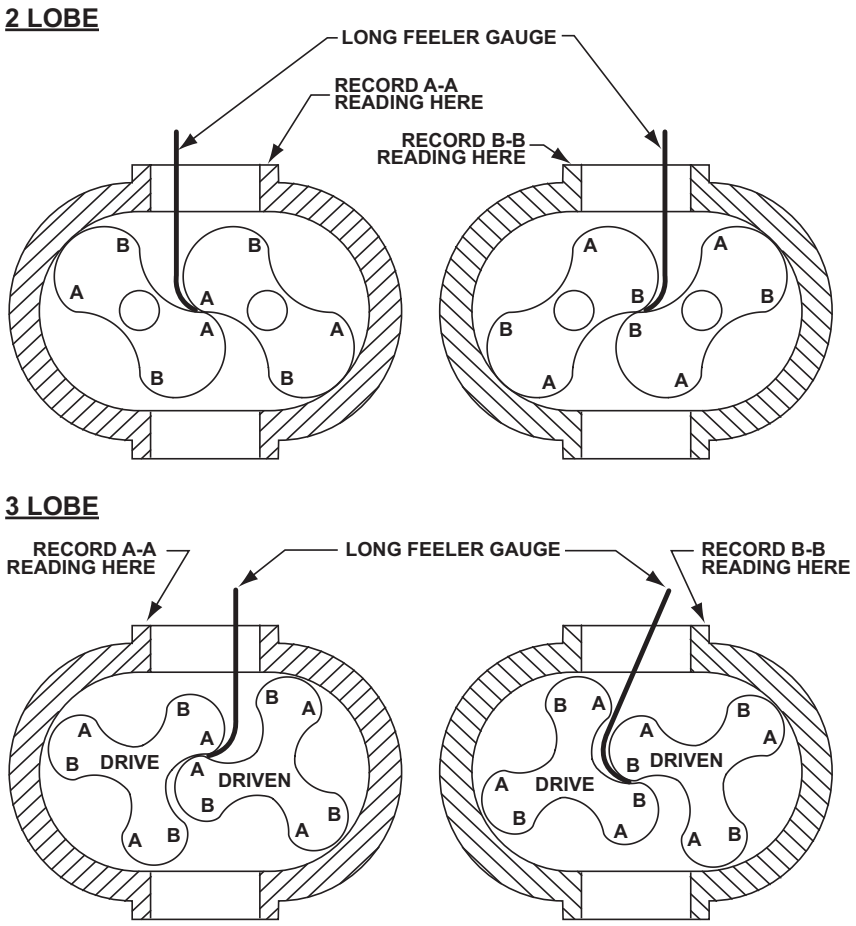


Figure 8-6 – Checking Rotor Interlobe Clearance

19. Install the gear cover using the same method as was used to install the drive cover (step 18).
20. Install the mounting feet, and secure with cap screws and washers.
21. Before putting the blower into operation, follow the instructions in ***Installation on page 11*** and ***Operation on page 23***. Observe the oil level frequently during the initial hours of operation. A badly installed or damaged oil seal will result in oil loss.

09

TROUBLESHOOTING

Although M-D Pneumatics blowers are well designed and manufactured, problems may occur due to normal wear and the need for readjustment. The following chart lists symptoms that may occur along with probable causes and remedies.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Loss of oil	Gear housing not tightened properly	Tighten gear housing bolts.
	Lip seal failure	Disassemble and replace lip seal.
	Insufficient sealant	Remove gear housing and replace sealant. ***See Disassembly of Blower on page 31***.
	Loose drain plug	Tighten drain plug.
Excessive bearing or gear wear	Improper lubrication	Correct oil level. Replace dirty oil. ***See Lubrication on page 15***.
	Excessive belt tension	Check belt manufacturer's specifications for tension and adjust accordingly.
	Coupling misalignment	Check carefully. Re-align if necessary.
Lack of volume	Slipping belts	Check belt manufacturer's specifications for tension and adjust accordingly.
	Worn lobe clearances	Check for proper clearances. ***See Assembly Clearances on page 38***.
	Speed too low	Increase blower speed within limits.
	Obstruction in piping	Check system to ensure an open flow path.
Knocking	Blower out of time	Re-time.
	Distortion due to improper mounting or pipe strains	Check mounting alignment and relieve pipe strains.
	Excessive pressure differential	Reduce to manufacturer's recommended pressure. Examine relief valve and reset if necessary.
	Worn gears	Replace timing gears. ***See Disassembly of Blower on page 31***.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Excessive blower temperature	Too much or too little oil in gear reservoir	Check oil level. ***See Lubrication on page 15***.
	Too low operating speed	Increase blower speed within limits.
	Clogged filter or silencer	Remove cause of obstruction.
	Excessive pressure differential	Reduce pressure differential across the blower.
	Elevated inlet temperature	Reduce inlet temperature.
	Worn lobe clearances	Check for proper clearances. ***See Assembly Clearances on page 38***.
Rotor end or tip drag	Insufficient assembled clearances	Correct clearances. ***See Assembly Clearances on page 38***.
	Case or frame distortion	Check mounting and pipe strain.
	Excessive operating pressure	Reduce pressure differential.
	Excessive operating temperature	Reduce pressure differential or reduce inlet temperature.
Vibration	Belt or coupling misalignment	Check carefully. Re-align if necessary.
	Lobes rubbing	Check cylinder for hot spots, and then check for lobe contact at these points. Correct clearances. ***See Assembly Clearances on page 38***.
	Worn bearings or gears	Check condition of gears and bearings. Replace if necessary.
	Unbalanced or rubbing lobes	Possible build-up on casing or lobes, or inside lobes. Remove build-up and restore clearances.
	Driver or blower loose	Check mounting and tighten if necessary.
	Piping resonance	Check pipe supports, check resonance of nearby equipment, and check foundation.

10

ASSEMBLY CLEARANCES

MODEL	LOBE TO END PLATES		LOBE TO CASING		INTERLOBE
	GEAR END	DRIVE END	TIP-DOWEL	TIP-PORT	MINIMUM
4504	0.004 – 0.008 in. (0.10 – 0.20 mm)	0.005 – 0.009 in. (0.13 – 23 mm)	0.007 – 0.011 in. (0.18 – 0.28 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.008 – 0.012 in. (0.20 – .30 mm)
4506	0.004 - 0.008 in. (0.10 – 0.20 mm)	0.006 – 0.010 in. (0.10 – 0.25 mm)	0.007 – 0.011 in. (0.18 – 0.28 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.008 – 0.012 in. (0.20 – 0.30 mm)
4509	0.004 - 0.008 in. (0.10 – 0.20 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.007 – 0.011 in. (0.18 – 0.28 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.008 – 0.012 in. (0.20 – 0.30 mm)
4512	0.004 - 0.008 in. (0.10 – 0.20 mm)	0.012 – 0.016 in. (0.30 – 0.41 mm)	0.007 – 0.011 in. (0.18 – 0.28 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.008 – 0.012 in. (0.20 – 0.30 mm)
4604	0.004 - 0.008 in. (0.10 – 0.20 mm)	0.005 – 0.009 in. (0.13 – 0.23 mm)	0.007 – 0.011 in. (0.18 – 0.28 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.008 – 0.012 in. (0.20 – 0.30 mm)
4606	0.004 - 0.008 in. (0.10 – 0.20 mm)	0.006 – 0.010 in. (0.10 – 0.25 mm)	0.007 – 0.011 in. (0.18 – 0.28 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.008 – 0.012 in. (0.20 – 0.30 mm)
4609	0.004 - 0.008 in. (0.10 – 0.20 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.007 – 0.011 in. (0.18 – 0.28 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.008 – 0.012 in. (0.20 – 0.30 mm)
4612	0.004 - 0.008 in. (0.10 – 0.20 mm)	0.012 – 0.016 in. (0.30 – 0.41 mm)	0.007 – 0.011 in. (0.18 – 0.28 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.008 – 0.012 in. (0.20 – 0.30 mm)
6012	0.005 - 0.009 in. (0.13 – 0.23 mm)	0.014 – 0.020 in. (0.36 – 0.51 mm)	0.008 – 0.013 in. (0.20 – 0.33 mm)	0.011 – 0.016 in. (0.28 – 0.41 mm)	0.012 – 0.016 in. (0.30 – 0.41 mm)
6016	0.005 - 0.009 in. (0.13 – 0.23 mm)	0.018 – 0.024 in. (0.46 – 0.61 mm)	0.008 – 0.013 in. (0.20 – 0.33 mm)	0.011 – 0.016 in. (0.28 – 0.41 mm)	0.012 – 0.016 in. (0.30 – 0.41 mm)
6024	0.005 - 0.009 in. (0.13 – 0.23 mm)	0.018 – 0.024 in. (0.46 – 0.61 mm)	0.011 – 0.016 in. (0.28 – 0.41 mm)	0.014 – 0.019 in. (0.36 – 0.48 mm)	0.012 – 0.016 in. (0.30 – 0.41 mm)

11 MAINTENANCE

Data shown represents “wet” torque values.

PART DESCRIPTION	TORQUE
CAP SCREW 10-32UNF	4 ft-lb (5 N-m)
CAP SCREW 1/4"-20UNC GR5	8 ft-lb (10 N-m)
CAP SCREW 5/16"-18UNC GR5	15 ft-lb (20 N-m)
CAP SCREW 3/8"-16UNC GR5	33 ft-lb (45 N-m)
CAP SCREW 1/2"-13UNC GR5	78 ft-lb (106 N-m)
CAP SCREW 5/8"-14UNC GR5	123 ft-lb (167 N-m)
CAP SCREW 3/4"-10UNC GR5	260 ft-lb (350 N-m)

12

RECOMMENDED LUBRICANTS

RECOMMENDED LUBRICANTS FOR BLOWERS AND VACUUM BOOSTERS

Positive displacement blowers and vacuum boosters require proper lubrication for bearings, seals and gears to operate effectively and efficiently. Oil is distributed from the oil reservoir to the critical components by means of oil slingers that are attached to the rotor shaft. In certain models of CP Series blowers, a high-performance grease rated for high temperatures is used on the drive-end bearings.

MD full synthetic lubricants are recommended for blowers and vacuum boosters. MD lubricants are specifically formulated using unique additives that provide maximum protection and extend the life of your product over mineral oils or semi-synthetic lubricants.

⚠ WARNING

Do not overfill the oil sumps. Overfilling can result in gear damage or oil leaks.

⚠ CAUTION

Units are shipped without oil in the sumps. Ensure adequate oil has been added before operating.

MD oils are suitable for a wide range of operating temperatures that are based on model, operating speed and discharge temperature of the product.

FOR OXYGEN-ENRICHED SERVICE

Blowers and vacuum boosters operated in oxygen enriched applications should only use non-flammable, PFPE full synthetic lubricants. Blowers and vacuum boosters used in hydrogen service should only MD full synthetic oil

NOTE: Oxygen-enriched service only applicable for PD Plus blowers and vacuum boosters.

⚠ CAUTION

M-D Pneumatics and Kinney does not accept responsibility for damage caused by use of lubricants that are not recommended by M-D Pneumatics and Kinney.

MD BLOWER & BOOSTER LUBRICANTS SPECIFICATIONS:				
PRODUCTS	**MD ONE**	**MD PLUS**	**MD MAX**	**MD FG**
VISCOSITY INDEX	150	154	157	141
@40°C, CST	99.1	231.7	340.9	99.3
@100°C, CST	14.4	27.6	37.2	13.9
FLASH POINT °F (°C)	510 (266)	480 (249)	491 (255)	515 (268)
POUR POINT °F (°C)	- 44 (-43)	-49 (-45)	-54 (-48)	-60 (-51)

NOTE: MD One Vapor Pressure: (mm Hg) 100ºF <0.00004; 200ºF <0.00018

MD BLOWER & BOOSTER LUBRICANTS OPTIONS					
MD OIL TYPE	**1 QUART**	**1 GALLON**	**5 GALLON**	**55 GALLON BARREL**	**CASE 12 QUARTS**
MD ONE	16444-MD1-Q	16444-MD1-G	16444-MD1-5G	16444-MD1-B	16444-MD1-Q-C
MD PLUS	16444-MD2-Q	16444-MD2-G	16444-MD2-5G	16444-MD2-B	16444-MD2-Q-C
MD MAX	16444-MD3-Q	16444-MD3-G	16444-MD3-5G	16444-MD3-B	16444-MD3-Q-C
MD FG	16444-MD1-Q-FG	16444-MD1-G-FG	16444-MD1-5G-FG	16444-MD1-B-FG	16444-MD1-Q-C-FG

13

SPECIAL TOOL DRAWINGS

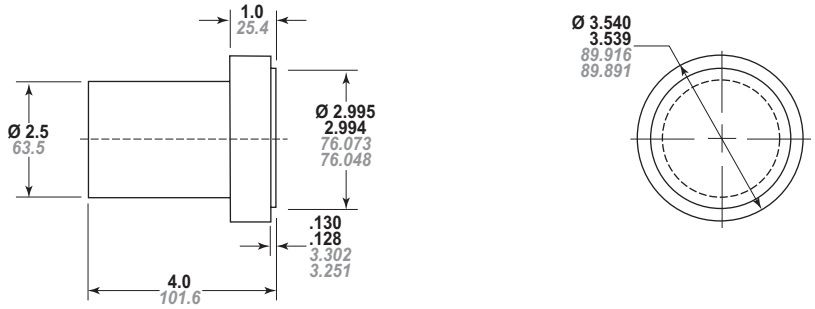


Figure 13-1 – Model 4500/4600 Lip Seal Pressing Tool

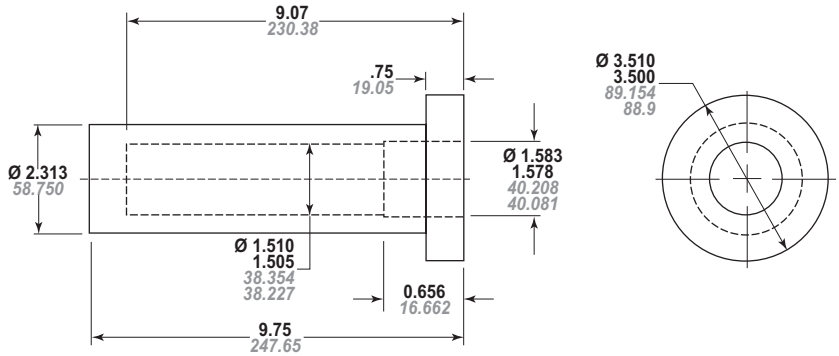


Figure 13-2 – Model 4500/4600 Bearing Installation Tool

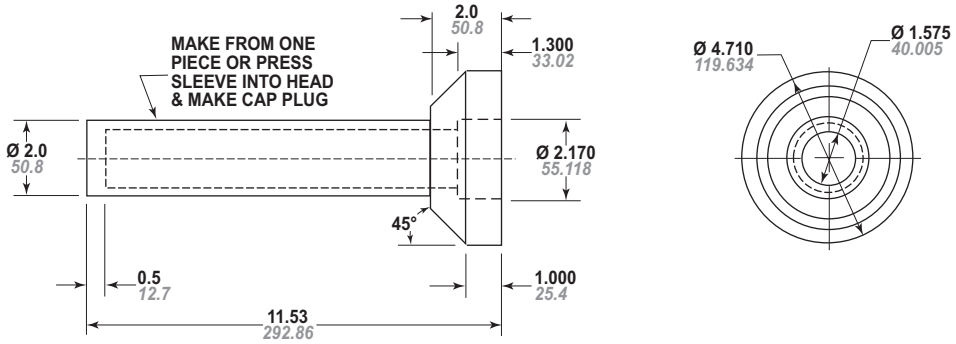


Figure 13-3 – Model 6000 Bearing Pressing Tool

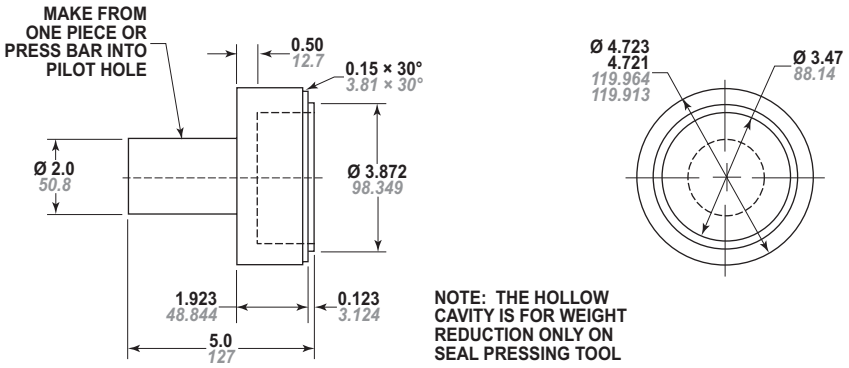


Figure 13-4 – Model 6000 Seal Pressing Tool

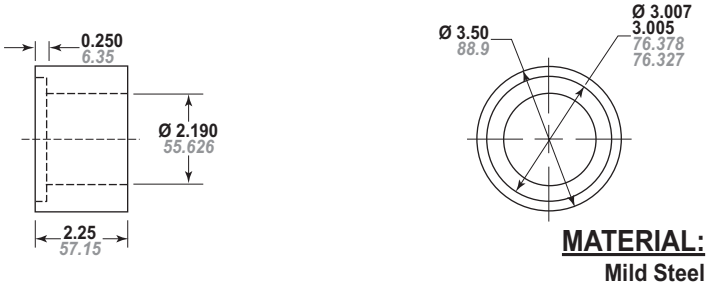


Figure 13-5 – Model 6000 Sleeve Pressing Ring (Use with Bearing Pressing Tool)

NOTE: All dimensions are shown in inches and millimeters.

PARTS LIST

Parts List for Equalizer DF Model 4500 Series Blowers

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor, Drive	1
2	Rotor, Driven	1
3	Housing	1
4	End Plate	2
6	End Cover, DE	1
7	End Cover, BE	1
8	Gear Assembly	1
9	Bearing, Dbl Row Ball	2
10	Bearing, Cylindrical Roller	2
12	Lip Seal	4
13	Lip Seal	1
14	Retainer Plate	2
20	Oil Slinger	1
20	Oil Slinger	1
22	Dowel Pin	4
23	Key, Drive Shaft	1
24	Key, Gear	2
25	Washer	2
26	Cap Screw	28
27	Washer	1
29	Cap Screw	2
31	Magnetic Drain Plug	2
37	Breather	2
39	Port Gasket	2
42	Nameplate	1
58	Seal Ring	4
62	Cap Screw	14
68	Spring Pin	1
70	Oil Gauge	2
80	Washer	4
90	Set Screw	2
123	Bearing Spacer	2
126	Roll Pin	4
174	Pipe Plug	4
239	Sleeve	4

ITEM NO.	PART DESCRIPTION	QTY
304	Mounting Foot	2
307	Cap Screw	5

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Equalizer RM Model 4600 Series Blowers

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor, Drive	1
2	Rotor, Driven	1
3	Housing	1
4	End Plate	2
6	End Cover, DE	1
7	End Cover, BE	1
8	Gear Assembly	1
9	Bearing, Dbl Row Ball	2
10	Bearing, Cylindrical Roller	1
12	Lip Seal	4
13	Lip Seal	1
14	Retainer Plate	4
20	Oil Slinger	1
20	Slinger	1
22	Dowel Pin	4
23	Key, Drive Shaft	1
24	Key, Gear	2
25	Washer	2
26	Cap Screw	28
27	Washer	1
29	Cap Screw	2
31	Magnetic Drain Plug	2
37	Breather	2
42	Nameplate	1
50	Roller Bearing	1
58	Seal Ring	4
62	Cap Screw	16
68	Roll Pin	1
70	Oil Gauge	2
80	Washer	8
90	Set Screw	2
123	Bearing Spacer	4
126	Roll Pin	4
174	Pipe Plug	4
239	Sleeve	4
281	Spacer	3

ITEM NO.	PART DESCRIPTION	QTY
282	Spring	3
304	Mounting Foot	2
307	Cap Screw	9

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Equalizer RM Model 6000 Series Blowers

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor, Drive	1
2	Rotor, Driven	1
3	Housing	1
4	End Plate	2
6	End Cover, DE	1
7	End Cover, BE	1
8	Gear Assembly	1
9	Ball Bearing	2
10	Roller Bearing	2
12	Lip Seal	4
13	Lip Seal	1
14	Retainer Plate	4
20	Slinger	1
22	Dowel Pin	4
23	Key, Drive Shaft	1
24	Key, Gear	2
25	Washer	2
26	Cap Screw	32
29	Cap Screw	3
30	Cap Screw	2
31	Magnetic Drain Plug	2
37	Breather	2
42	Nameplate	1
58	Seal Ring	4
62	Cap Screw	16
68	Roll Pin	1
70	Oil Gauge	2
80	Washer	10
117	Washer	2
123	Bearing Spacer	2
126	Roll Pin	4
174	Pipe Plug	2
195	Lift Lug	2
239	Sleeve	4
281	Spacer	2
282	Spring	4
304	Mounting Foot	2

ITEM NO.	PART DESCRIPTION	QTY
304	Mounting Foot	2
307	Cap Screw	10

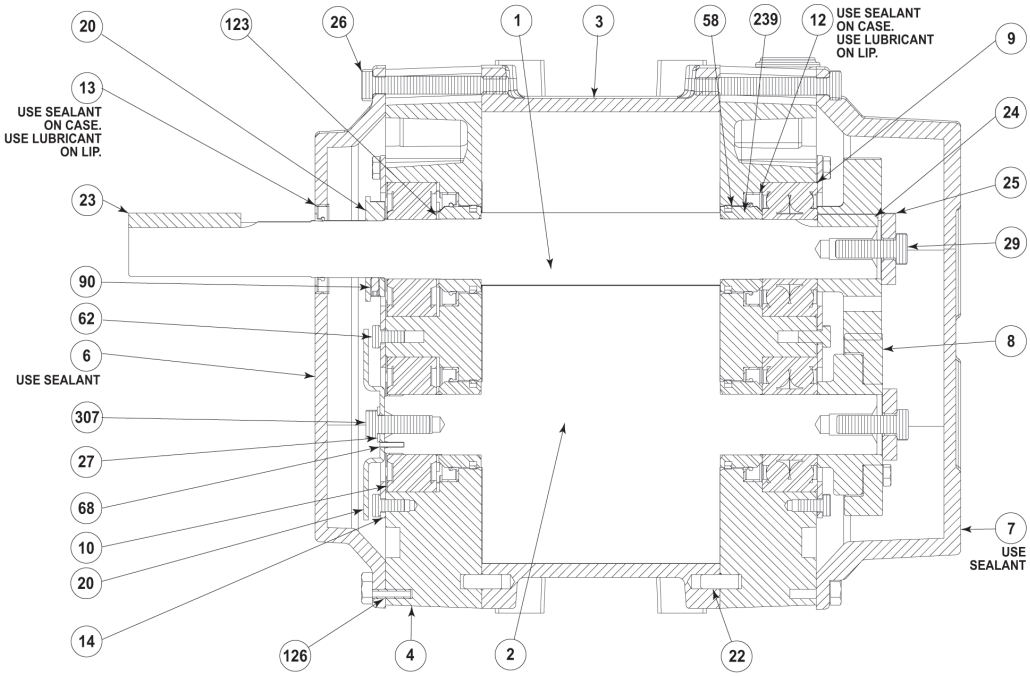
NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

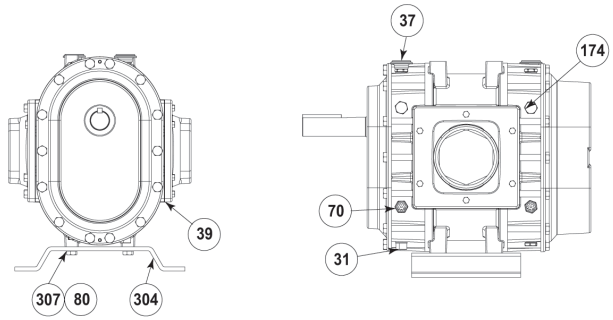
PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

ASSEMBLY DRAWINGS

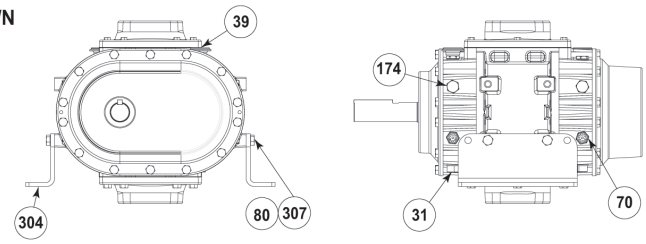
Cutaway Drawings for Models 4504, 4506, 4509, and 4512



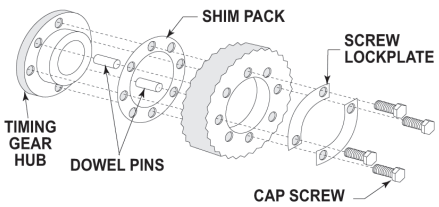
HORIZONTAL FLOW
TOP DRIVE SHOWN



VERTICAL FLOW
LEFT DRIVE SHOWN

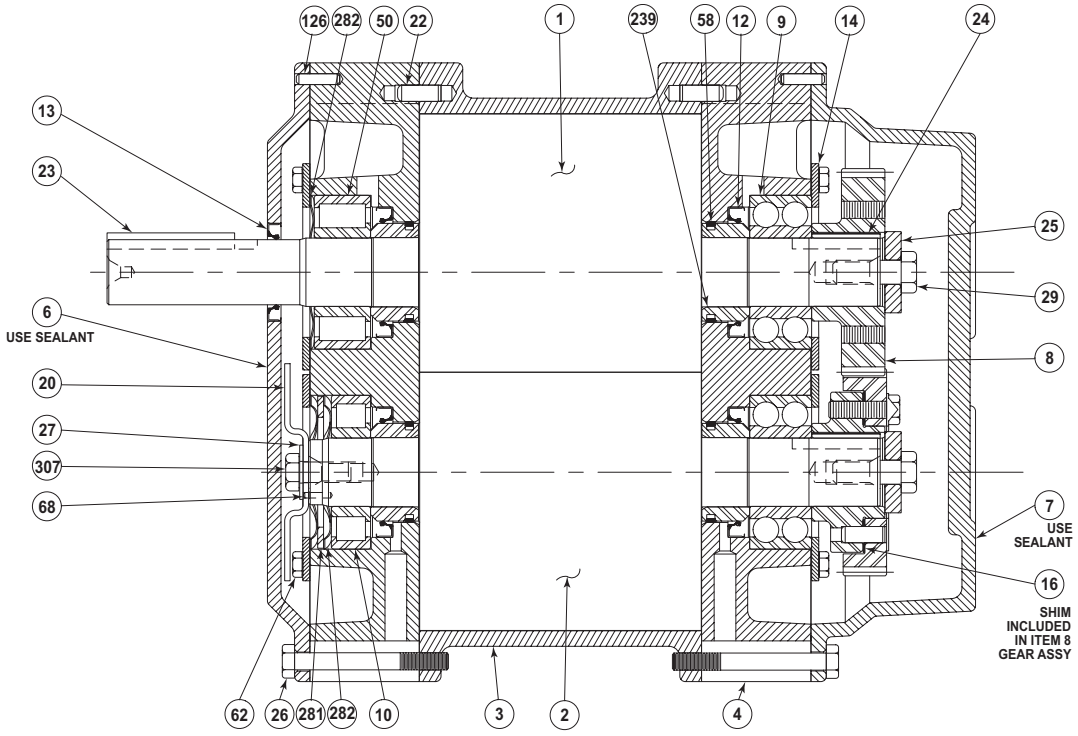


TIMING GEAR
ASSEMBLY (ITEM 8)

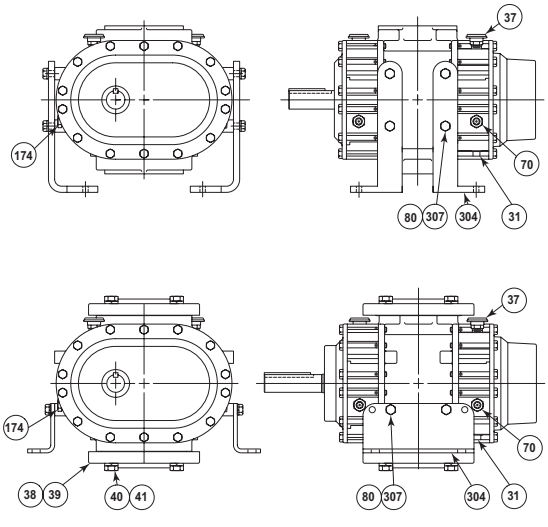


ALL PORTS SHOWN
ARE OPTIONAL

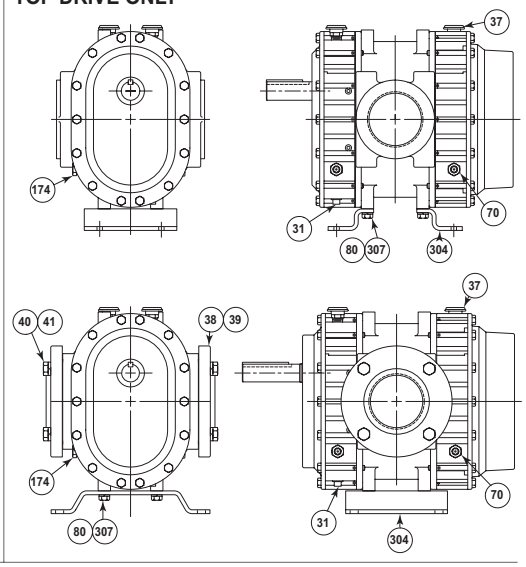
Cutaway Drawings for Models 4604, 4606, 4609, and 4612



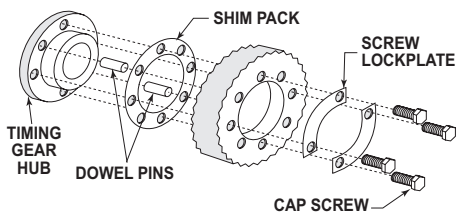
VERTICAL FLOW
LEFT DRIVE SHOWN



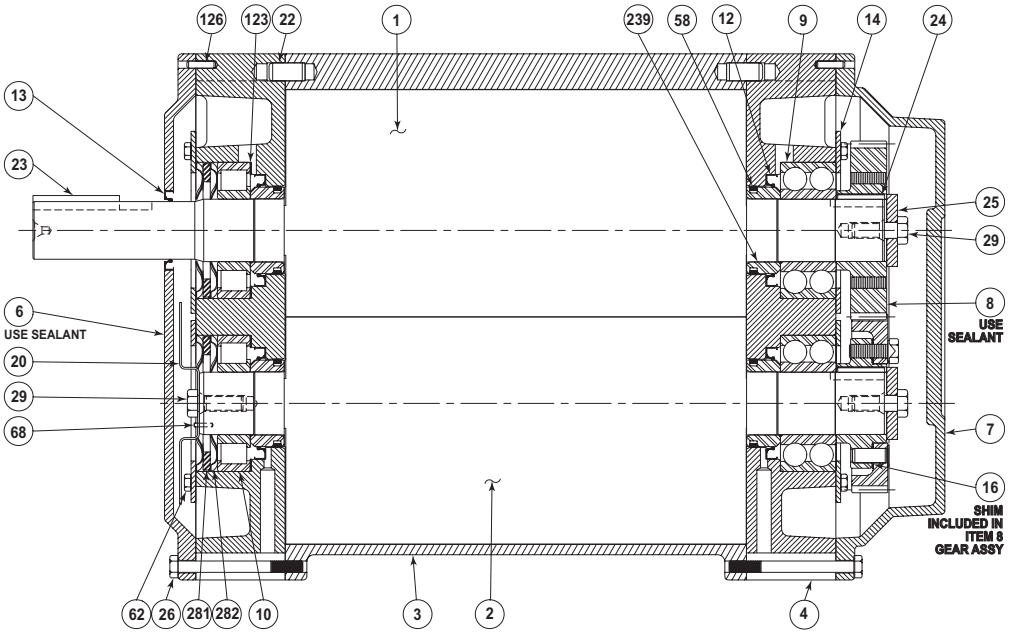
HORIZONTAL FLOW
TOP DRIVE ONLY



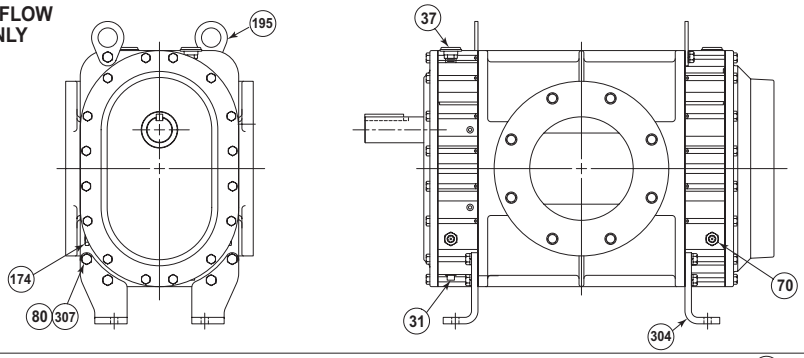
TIMING GEAR
ASSEMBLY (ITEM 8)



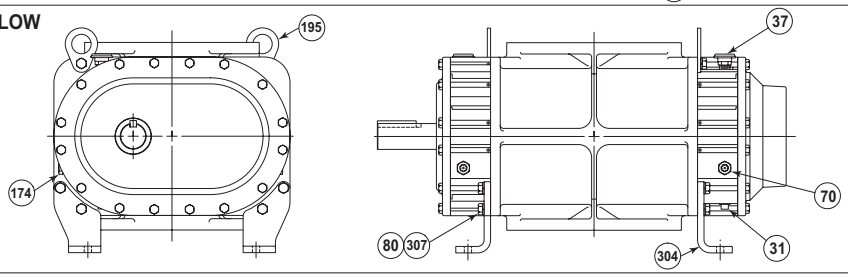
Cutaway Drawings for Models 6012, 6016, and 6024



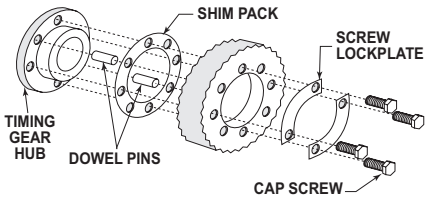
HORIZONTAL FLOW
TOP DRIVE ONLY



VERTICAL FLOW



TIMING GEAR
ASSEMBLY (ITEM 8)



WARRANTY – BLOWER PRODUCTS

Subject to the terms and conditions hereinafter set forth and set forth in General Terms of Sale, M-D Pneumatics (the Seller) warrants products and parts of its manufacture, when shipped, and its work (including installation and start-up) when performed, will be of good quality and will be free from defects in material and workmanship. This warranty applies only to Seller's equipment, under use and service in accordance with seller's written instructions, recommendations and ratings for installation, operating, maintenance and service of products, for a period as stated in the table below. Because of varying conditions of installation and operation, all guarantees of performance are subject to plus or minus 5% variation. (Non-standard materials are subject to a plus or minus 10% variation)

PRODUCT TYPE	TYPE OF APPLICATION	
	ATMOSPHERIC AIR OR PROCESS AIR WITHOUT LIQUIDS PRESENT	PROCESS GASES OTHER THAN AIR, OR ANY LIQUID INJECTED APPLICATION
New *(Qx™ models only)*	30 months from date of shipment, or 24 months after initial startup date, whichever occurs first.	Consult Factory
New *(all other models)*	24 months from date of shipment, or 18 months after initial startup date, whichever occurs first	18 months from date of shipment, or 12 months after initial startup date, whichever occurs first
Repair	12 months from date of shipment, or remaining warranty period, whichever is greater	12 months from date of shipment, or remaining warranty period, whichever is greater

THIS WARRANTY EXTENDS ONLY TO BUYER AND/OR ORIGINAL END USER, AND IN NO EVENT SHALL THE SELLER BE LIABLE FOR PROPERTY DAMAGE SUSTAINED BY A PERSON DESIGNATED BY THE LAW OF ANY JURISDICTION AS A THIRD PARTY BENEFICIARY OF THIS WARRANTY OR ANY OTHER WARRANTY HELD TO SURVIVE SELLER'S DISCLAIMER.

All accessories furnished by Seller but manufactured by others bear only that manufacturer's standard warranty.

All claims for defective products, parts, or work under this warranty must be made in writing immediately upon discovery and, in any event within one (1) year from date of shipment of the applicable item and all claims for defective work must be made in writing immediately upon discovery and in any event within one (1) year from date of completion thereof by Seller. Unless done with prior written consent of Seller, any repairs, alterations or disassembly of Seller's equipment shall void warranty. Installation and transportation costs are not included and defective items must be held for Seller's inspection and returned to Seller's Ex-works point upon request.

THERE ARE NO WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OF PURPOSE.

After Buyer's submission of a claim as provided above and its approval, Seller shall at its option either repair or replace its product, part, or work at the original Ex-works point of shipment, or refund an equitable portion of the purchase price.

The products and parts sold hereunder are not warranted for operation with erosive or corrosive material or those which may lead to build up of material within the product supplied, nor those which are incompatible with the materials of construction. The Buyer shall have no claim whatsoever and no product or part shall be deemed to be defective by reason of failure to resist erosive or corrosive action nor for problems resulting from build-up of material within the unit nor for problems due to incompatibility with the materials of construction.

Any improper use, operation beyond capacity, substitution of parts not approved by Seller, or any alteration or repair by others in such manner as in Seller's judgment affects the product materially and adversely shall void this warranty.

No employee or representative of Seller other than an Officer of the Company is authorized to change this warranty in any way or grant any other warranty. Any such change by an Officer of the Company must be in writing.

The foregoing is Seller's only obligation and Buyer's only remedy for breach of warranty, and except for gross negligence, willful misconduct and remedies permitted under the General Terms of Sale in the sections on CONTRACT PERFORMANCE, INSPECTION AND ACCEPTANCE and the PATENTS Clause hereof, the foregoing is BUYER'S ONLY REMEDY HEREUNDER BY WAY OF BREACH OF CONTRACT, TORT OR OTHERWISE, WITHOUT REGARD TO WHETHER ANY DEFECT WAS DISCOVERED OR LATENT AT THE TIME OF DELIVERY OF THE PRODUCT OR WORK. In no event shall Buyer be entitled to incidental or consequential damages. Any action for breach of this agreement must commence within one (1) year after the cause of action has occurred.

May 2008

OPERATING DATA FORM / PRODUCT REGISTRATION

It is to the user's advantage to have the requested data filled in below and available in the event a problem should develop in the blower or the system. This information is also helpful when ordering spare parts.

Model No. _____ V-Belt Size _____ Length _____

Serial No. _____ Type of Lubrication _____

Startup Date _____ _____

Pump RPM _____ Operating Vacuum _____

Pump Sheave Diameter _____ Any other Special Accessories Supplied or in use:

Motor Sheave Diameter _____ _____

Motor RPM _____ HP _____ _____

NOTES: _____

_____

_____

_____

IMPORTANT

All blowers manufactured by M-D Pneumatics are date coded at time of shipment. In order to assure you of the full benefits of the product warranty, please complete, tear out and return the product registration card. You may also register your product online at www.mdpneumatics.com or contact Customer Service.

M-D Pneumatics®

For Service & Repair, Technical Support, or Product Sales contact:

M-D Pneumatics
4840 West Kearney Street
Springfield, Missouri USA 65803-8702
O 417.865.8715 800.825.6937
F 417.865.2950
www.mdpneumatics.com

MEMBER OF CAGI Compressed Air & Gas Institute

Manual 2014 Rev D p/n 002014 0000
04/21

05 INSTALLATION

GENERAL

⚠ DANGER

The blower is not intended to be used with explosive products or in explosive environments. The blower is not intended to be used in applications that include hazardous and toxic gases. Consult the factory for support.

⚠ DANGER

It is the responsibility of the installer to assure that proper guarding is in place and compliant with all applicable regulatory requirements.

⚠ WARNING

The bare shaft blower can generate excessive noise. Methods to reduce the noise levels by installing inlet and outlet silencers will be required. Even with inlet and outlet silencers, hearing protection will be required.

⚠ WARNING

Customers are warned to provide adequate protection, warning and safety equipment necessary to protect personnel against hazards in the installation and operation of this equipment in the system or facility.

⚠ WARNING

The standard MAWP is per *Table 4-2*. The MAWP shall not be exceeded unless specific factory testing of the pressure containing components of the blower has been performed.

⚠ WARNING

***Table 4-2* states the maximum operating speed in RPM (rotations per minute) and maximum temperature. Do not exceed these limits. The installation of the blower shall take these critical operating parameters into account and adequate control features implemented.**

⚠ WARNING

Upon completion of the installation, and before applying power, rotate the drive shaft by hand. It must move freely. If it does not, look for uneven mounting, piping strain, excessive belt tension or coupling misalignment or any other cause of binding. If blower is removed and still does not move freely, check inside the blower housing for foreign material.

NOTICE

Remove the protective covers from the shaft and inspect for damage.

Carefully check to ensure that no transit damage has been sustained. If damage has occurred from shipment, file a claim with the carrier immediately. Preserve the shipping container for inspection by the carrier.

NOTICE

In the event that your unit sustains damage while being shipped to your facility, do not return it to the factory without first obtaining shipping instructions from us.

Do not remove protective covers and plugs until the connections are complete. Mount the blower on a flat, level surface. Use a baseplate that is rigid, solidly supported, and structurally sound. Shim under the legs where necessary so that each leg of the blower supports an equal share of the blower weight. This is necessary to prevent twisting of the blower. Make sure the feet rest evenly on the mounting surface before fastening down. Twisting or cramping the blower during mounting will cause rotor contact and binding during operation, resulting in a condition called “soft foot.” ***See Soft Foot on page 14*** for further details and preventative measures.

A blower that is factory-mounted on a base should not require such adjustments. However, since the assembly can become twisted in shipping or installation, check for soft foot after installing the base. Shims may be needed for alignment. Loosen the foot hold-down screws to check foot contact with the mounting surface. Mount the base on a solid foundation or heavy flooring, using shims as necessary at bolting points to prevent warping the assembly.

Transmission of small operating vibrations to a support structure may be objectionable in some applications. Use of vibration isolators or vibration-absorbing materials can be effective in overcoming this transmission. To avoid causing distortion, apply the treatment under the common motor/blower base or mounting plate rather than directly under the feet alone.

Make sure piping is accurately squared with the blower and supported independently. Stress imparted from incorrectly aligned piping or mounting will create problems with bearing and seal life, possibly leading to premature internal contact. The blower should sit stress free and evenly on its supporting surface. Take care to evenly tighten the mounting bolts to avoid imparting undue stress into the blower. Stress can be checked in a free state with feeler stock or verified on a previously installed blower with the aid of a dial indicator. Spring or gap should be less than 0.002 in. (0.05 mm).

Use only clean, new pipe and make certain it is free of scale, cuttings, weld beads, dirt, or any other foreign material. To guard against damage to the blower, make sure that an inlet filter is used. Clean the filter of collected debris after 3 hours of operation and periodically thereafter. ***See Piping Connections on page 17*** for additional details.

Figure 5-1 shows a typical complete installation of the blower and accessories. Note the absence of throttle or shut-off valves in both discharge and intake piping. If it is possible for airflow to be cut off in either line, add a pressure and/or vacuum relief valve. In some installations, it may be desirable to use only an inlet silencer-cleaner supported directly from the blower connection. Keep the weight of accessories and piping to a minimum to prevent blower casing distortion. If the weight exceeds 10% of blower weight, support the components independently of the blower and connect them with a flexible hose or connectors. The approximate weight of the blower is listed in ***Table 4-1 on page 8***.

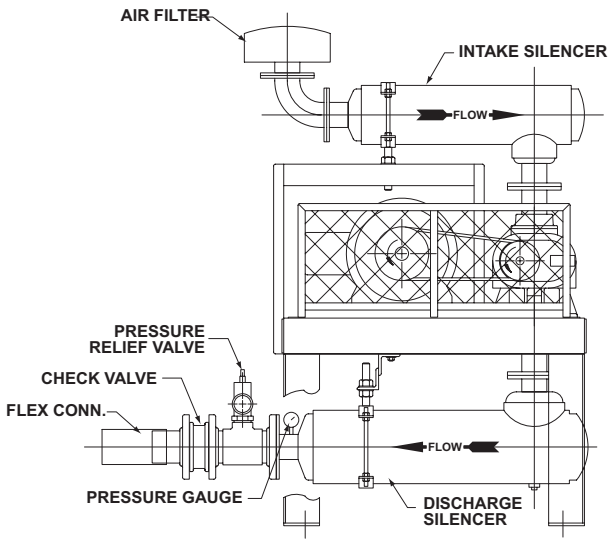


Figure 5-1 – Typical Blower Installation

A blower may be driven by direct-coupling to the driver or by V-belt drive for the purpose of obtaining other speeds within the approved range. ***See Motor Drives on page 19*** for more information.

Blowers from M-D Pneumatics are internally and externally treated after factory assembly and testing to protect against rusting in normal atmospheric conditions prior to installation. The maximum period of internal protection is considered to be 6 months under average conditions, provided closing plugs and seals are not removed. Protection against chemical or salt-water atmosphere is not provided. Avoid opening the blower until ready to begin installation, as protection will be quickly lost due to evaporation. For recommended preparations for long-term storage (longer than 6 months), ***see Long-Term Storage on page 30***.

Location

Install the blower in a room or outdoor area that supplies adequate space and lighting for routine maintenance. Make sure that indoor installation areas are well ventilated and kept as cool as possible, because operating the blower at elevated temperatures can result in nuisance overload or temperature shutdowns. An unprotected outdoor installation is satisfactory only when correct lubrication for the expected temperatures is provided. ***See Recommended Lubricants for Blower and Vacuum Boosters on page 35***.

Blower Air Intake

To minimize maintenance, supply the blower with the cleanest air possible. The air must not contain any flammable or toxic gases, as the blower will concentrate these gases. This could result in damage to the blower and surrounding property and lead to personal injury or death. Do not block or restrict the opening of the blower, as the motor could overheat and fail.

Do not use blowers on explosive or hazardous gases. Do not exceed the limits described in ***Table 4-2*** on performance criteria such as pressure differential, running speed, and discharge temperature.

If it is necessary to take air from a remote source, such as in a vacuum application, make sure the diameter of the piping is at least equal to the diameter of the blower inlet. For distances greater than 20 ft (6 m), enlarge the pipe diameter to reduce inlet restriction. Excessive restriction will reduce the efficiency of the blower and elevate its discharge temperature. The piping used should also be corrosion-resistant and free of scale and dirt. Keep the inlet covered to keep out foreign objects and rain. Vacuum kits are available.

Soft Foot

Soft foot is a condition in which one of the blower feet does not sit flat on the base. Soft foot is usually due to irregularities in the surface to which the blower is mounted. When the bolt on the foot gets tightened, a slight distortion occurs that can affect bearing and seal life as well as internal contact between parts.

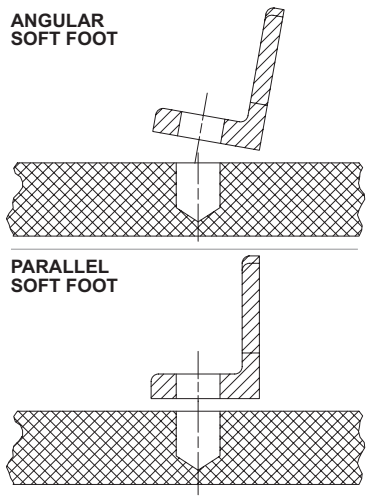


Figure 5-2 – Illustrations of Soft Foot

1. Place the blower on the base.
2. Check each foot for gaps between the foot and base (soft foot). Shim as necessary to fill the gap within 0.002 in. (0.05 mm).
   Figure 5-2 shows the two most common types of soft foot conditions. If either type is present at a measurement of more than 0.003 in. (0.076 mm), the blower may fail prematurely.
3. Tighten all bolts.
4. Mount a dial indicator on the base contacting one foot at 12 o'clock position.
5. Loosen the bolt on that foot. Observe indicator travel and add shims as needed to reduce "spring" to less than 0.002 in. (0.05 mm). Repeat steps 4 and 5 on the remaining feet.

SAFETY

M-D Pneumatics recommends the use of relief valves to protect against excessive pressure or vacuum conditions. Test these valves at initial start-up to be sure they are properly adjusted to relieve at or below the maximum pressure differential rating of the blower.

⚠ DANGER

It is the responsibility of the installer to assure that proper guarding is in place and compliant with all applicable regulatory requirements.

⚠ DANGER

Internal and external rotating parts of the blower and driving equipment can produce serious physical injuries. The blower should never be run with the inlet or discharge piping removed. If it becomes necessary to inspect the rotating parts of the blower or to change V-belts, be absolutely sure that all power to the motor controls has been shut off, the motor controls are locked out, and properly tagged before proceeding.

⚠ DANGER

Assure that properly sized vacuum breaks/ relief valves are used on the inlet side of the blower. Also assure that properly sized pressure relief valves are used on the outlet of the blower. The sizing shall be such to assure that the proper flow can be achieved without exceeding the rated vacuum and pressure ratings.

⚠ DANGER

Blower housing and associated piping or accessories may become hot enough to cause major skin burns on contact.

⚠ WARNING

Use lock out/tag out procedures to disable the electrical energy source before any service or work is done on the blower.

⚠ WARNING

Avoid extended exposure in close proximity to machinery with high intensity noise levels. Wear adequate ear protection.

NOTE: Use proper care and good procedures in handling, lifting, installing, operating, and maintaining the equipment.

LUBRICATION

Every blower from M-D Pneumatics is factory-tested, oil-drained, and shipped dry to its installation point. Fill both independent oil reservoirs to the proper level before operation. Oil reservoirs are under the vacuum.

Shaft bearings at the gear end of the blower are splash-lubricated by one or both gears dipping into an oil reservoir formed in the gear end plate and cover. Shaft bearings at the drive end of the blower are lubricated by a slinger assembly dipping into an oil reservoir. Before starting the blower, fill the oil sumps as described in ***Filling Procedure on page 16***.

Add oil to the blower in the quantity listed in ***Table 4-1 on page 8***. Make sure oil level is maintained within the notched area of the sight glass. ***See Figure 5-3***. Lower drive blowers have “bull’s eye” type oil level gauges. Maintain oil levels at the center of the glass.

⚠ WARNING

Never attempt to change or add lubrication while the blower is running. Failure to heed this warning could result in damage to the equipment or personal injury. Oil must be checked when the blower is NOT running.

⚠ WARNING

Properly dispose of the spent lubricants. Refer to the manufacturer of the lubricant and any regulations to assure proper and safe disposal.

⚠ WARNING

Do not start the blower until you are sure oil has been put in the gear housing and rear cover. Operation of the blower without proper lubrication will cause the blower to fail and void the warranty.

NOTICE

Assure oil is compatible with copper/yellow metals (if equipped with cooling coils).

NOTICE

***See Table 4-1** for oil capacities.*

Filling Procedure

See Recommended Lubricants for Blower and Vacuum Boosters on page 35 for suggested lubricants and grease.

1. Remove the fill plugs or breathers from both gear end and drive end plates.
2. Slowly pour oil through the fill until oil appears in the oil sight glass. Bring the oil level to the center of the sight glass.
3. Verify oil level is at proper level in both gear end and drive end sight glasses.
4. Replace the fill plugs or breathers that were removed in step 1.

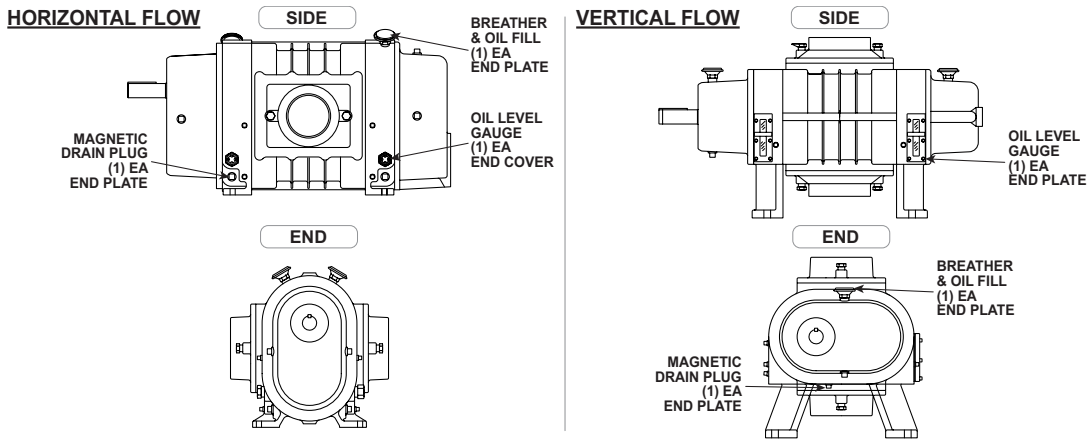


Figure 5-3 – Oil Fill, Drain Connections, and Oil Level Gauges

Frequently Asked Questions Regarding Lubrication

What is the functional detriment if the "wrong oil" is used?

The lubricant is selected based on bearing speed, gear speed, and operating temperature. If the lubricant is too light, it increases wear by not separating the sliding surfaces and it will not remove the heat adequately. If the lubricant is too

thick, the drag in the bearings is increased, causing them to run hotter. Thicker lubricant will not flow as readily into the gears and it will reduce the available backlash. Lubricants at our conditions are incompressible.

What is the functional detriment if the oil is not serviced?

If the lubricant is not serviced at the proper interval, the shearing action in the bearing and the gears will begin to take its toll and the lubricant will thicken. The blower will run hotter and the wear on moving parts will increase. The lubricant will generally appear dirtier, caused by material rubbing off the components. The lubricant will discolor because of overheating. An indicator of the breakdown of a lubricant is the increase in the Total Acid Number (TAN) and a change of 10 percent in the base viscosity.

Several things are happening as the lubricant goes through the blower. First, it is absorbing frictional energy in the form of heat. This heat has to be dissipated through either surface contact with cooler materials or in a rest volume of lubricant. While reducing the friction, the lubricant is also going through a shearing process and the molecular structure is broken down.

The result is that the lubricant will begin to thicken because of the shorter molecular chains and the drop out of additive packages. The thickened lubricant will cause more drag, increasing the friction and heat and further degrading the lubricant.

Operation of the blower (environment, run time, speed, and pressure) has a direct effect on duty cycles. The published cycles are based on worst-case conditions.

Hazards Associated With Breakdown or Ignition of Lubrication

⚠ DANGER

There is a risk associated with the lubrication media breaking down and resulting in a hazardous fluid or vapor. There may also be a hazard associated with the ignition of the lubrication media. Refer to the lubrication manufacturer's applicable instruction for safety precautions.

PIPING CONNECTIONS

⚠ WARNING

Pipe loading on the blower should be negligible as pipe loading can cause distortion of the blower. Use proper supports and pipe hangers to assure that there is no loading.

NOTICE

Remove the protective covers from the inlet and outlet ports and inspect for dirt and foreign material.

Inlet and outlet connections on all blowers are large enough to handle maximum volume with minimum friction loss. Maintain same-diameter piping. Do not support silencers by the blower. Avoid stress loads and bending moments.

Be certain all piping is clean internally before connecting to the blower. Place a 16-mesh wire screen backed with hardware cloth at or near the inlet connections for the first 50 hours of use until the system is clean. Clean the screen after 3 hours of operation and completely discard it once the system is clean, as it will eventually deteriorate and small pieces going into the blower can cause serious damage. A horizontal or vertical airflow piping configuration is easily achieved by rearranging the mounting feet position.

Hazards Associated With Hazardous Process Fluids

⚠ DANGER

It shall be the responsibility of the installer to ensure that piping is adequate, sealing between pipe joints is adequate for the process fluids and proper process and pressure protection devices are in place. It is also the responsibility of the installer to assure that process gasses are not vented in a manner that would be hazardous.

Refer to the manufacturer of the process media to assure that proper safety precautions are in place.

Blockage or Restriction

⚠ WARNING

Damage to the blower could occur if there is blockage in the inlet or outlet ports or piping. Care should be taken when installing the blower to assure that there are no foreign objects or restrictions in the ports or piping.

COOLING COILS (OPTIONAL)

⚠ CAUTION

If the blower is to be located outdoors or in a building where the temperature surrounding the blower or the water supply and return piping can fall below 35°F (2°C), then care must be taken to ensure that the water (or other cooling liquid) does not freeze and cause damage. Cooling coils must be drained of liquid during downtime unless a recirculating unit using a glycol mixture has been installed.

NOTICE

Water cooled end plates are discontinued. Consult factory for connection details.

NOTICE

Units are never shipped from the manufacturer with liquid in the end plates or cooling coils.

Blowers supplied with coiling coils can be identified by the hose that connects the top of the gear (drive) end cover to the bottom of the free (non-drive) end cover. ***See Figure 5-4*** and ***Figure 6-1*** for details. M-D Pneumatics recommends water cooling for blowers in applications where the blower operates with discharge temperatures of 250°F (120°C) for 4 hours or more per day. Water cooling reduces oil temperature and improves oil viscosity for better lubrication. A water flow of 0.5 – 1.0 GPM (1.9 – 3.8 L/min) is generally sufficient to maintain oil temperatures of 150°F (65°C) or below. Do not allow water pressure to exceed 75 psig (510 kPa g).

COOLING WATER CONNECTIONS AND SPECIFICATIONS — COOLING COILS (OPTIONAL)

⚠ WARNING

The cooling water pressure shall not exceed 75 psig (5.17 bar g).

Establish proper gap between coupling halves according to the coupling manufacturer's instructions with the motor armature. Proper gap will minimize the chance of end thrust on the blower shaft. Re-align and grease all direct-coupled base-mounted blowers after field installation.

MOTOR DRIVES

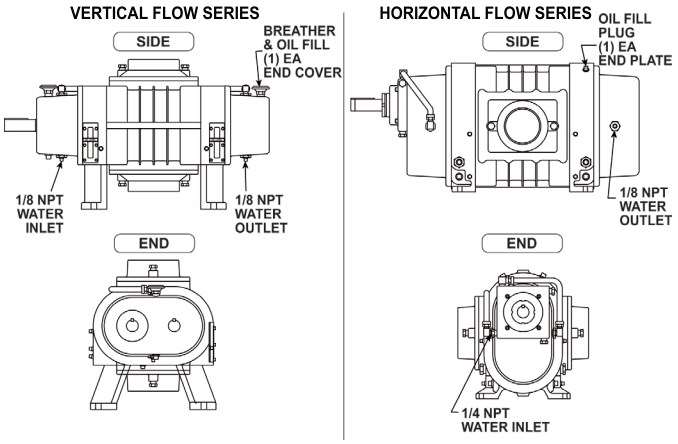


Figure 5-4 – Water Cooling Connections

Two drive connections commonly used are direct drive and V-belt drive.

Direct Coupled

When installing the motor directly to the blower, align the shafts to the coupling according to the coupling manufacturer's instructions. Blowers shipped with the motor directly coupled and mounted on a common base have been aligned prior to shipment. Further alignment is not normally necessary, but be sure to check the alignment and make adjustments if necessary prior to starting the blower.

Coupling halves must correctly fit the blower and drive shafts so that only light tapping is required to install each half. The two shafts must be accurately aligned. A direct-coupled blower and motor must be aligned with the two shafts having no more than 0.005 in. (13 mm) Total Indicator Reading (TIR). Make sure the face is aligned within 0.002 in. (0.05 mm).

Establish proper gap between coupling halves according to the coupling manufacturer's instructions with the motor armature. Proper gap will minimize the chance for end thrust on the blower shaft. Re-align and grease all direct-coupled base-mounted blowers after field installation.

V-Belts

If the motor and blower are V-belt connected, the sheaves on both the motor and blower shafts should be as close to the shaft bearings as possible. Blower sheave is not more than 1/4 in. (6.5 mm) from the blower drive end cover. The drive sheave is as close to the driver bearing as possible. Take care when installing sheaves on the blower and motor shafts. Make sure the face is accurately in line to minimize belt wear.

Adjust the belt tension to the manufacturer's specifications using a belt tension tester. Check new belts for proper tension after 24 hours of run time. When manufacturer data is not available, industry guidelines recommend 1/64 in. deflection for each inch of span (0.157 mm deflection per centimeter of span) at 8 – 10 lb (3.6 – 4.5 kg) of force in the center of the belt.

Insufficient tensioning is often indicated by slipping (squealing) at start-up. Do not use belt dressing on V-belts. Keep sheaves and V-belts free of oil and grease. Remove tension from belts if the drive is to be inactive for an extended period of time. For more specific information, consult the drive manufacturer. In a V-belt drive, the blower sheave must fit its shaft accurately, run true, and be mounted as close to the bearing housing as possible to minimize bearing loads.

A tight or driving fit will force the drive shaft out of its normal position and cause internal damage. A loose fit will result in shaft damage or breaking. Make sure the motor sheave fits correctly and is properly aligned with the blower sheave.

Adjust the motor position on its sliding base so that belt tension is in accordance with drive manufacturer's instructions. Always avoid excessive belt tension. Recheck tension after the first 10 hours of operation and periodically thereafter to avoid slippage and loss of blower speed.

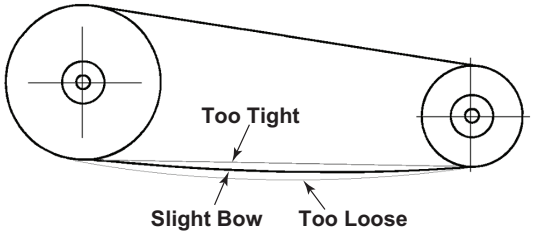


Figure 5-5 – General appearance of a V-belt drive

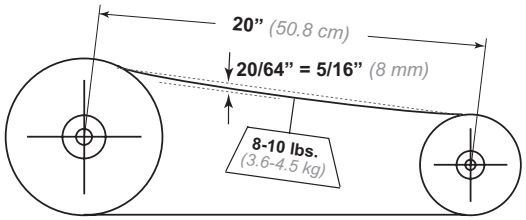


Figure 5-6 – Setting of proper tension for a V-belt drive

Check the blower after installation and before applying power by rotating the drive shaft by hand.

If the drive shaft does not rotate freely:

- Look for uneven mounting, piping strain, excessive belt tension, or coupling misalignment
- Check the blower to make sure oil was added to the reservoirs

Setting V-Belt Tension

Proper belt tension is essential to long blower life. ***Figure 5-5***, ***Figure 5-6***, and the following procedure are provided to aid in field-adjusting V-belts (when the blower is so equipped) for maximum performance. A visual inspection of the V-belt drive should yield the appearance shown in ***Figure 5-5***.

Factors outside the control of the belt tensioning system used on an individual blower package assembly, such as environmental factors and quality of the belts installed, may contribute to decreased belt life. Such factors can cause wear of the belts beyond the ability of the tensioning system to compensate.

As such, it is recommended to check belt tension monthly and make any manual adjustments found necessary.

1. Turn off and lock out power.
2. Remove the belt guard fasteners (if equipped).
3. Remove the belt guard.
4. Check and adjust the belt tension as necessary. Tension should be 1/64 in. deflection per inch of span (0.157 mm deflection per centimeter of span) between sheaves, with 8 – 10 lb (3.6 – 4.5 kg) force applied at the center point of the top section of belt.
5. Install the belt guard, making sure that all drive components are free of contact with the guard.
6. Install the belt guard fasteners that were removed in step 2.
7. Unlock the power and start the blower.
8. Resume normal operation.

V-Belt Troubleshooting

PROBLEM	POSSIBLE CAUSES	SOLUTION
Belts slip (sidewalls glazed)	Not enough tension	Replace belts; apply proper tension.
Drive squeals	Shock load	Apply proper tension.
	Not enough arc of contact	Increase center distance.
	Heavy starting load	Increase belt tension.
Belt(s) turned over	Broken cord caused by prying on sheave	Replace set of belts and install correctly.
	Overloaded drive	Redesign drive.
	Impulse loads	Apply proper tension.
	Misalignment of sheave and shaft	Re-align drive.
	Worn sheave grooves	Replace sheaves.
	Excessive belt vibration	Check drive design. Check equipment for solid mounting. Consider use of banded belts.
Mismatched belts	New belts installed with old belts	Replace belts in matched sets only.
Breakage of belt(s)	Shock loads	Apply proper tension; recheck drive.
	Heavy starting loads	Apply proper tension; recheck drive. Use compensator starting.
	Belt pried over sheaves	Replace set of belts correctly.
	Foreign objects in drives	Provide drive guard.

PROBLEM	POSSIBLE CAUSES	SOLUTION
Rapid belt wear	Sheave grooves worn	Replace sheaves.
	Sheave diameter too small	Redesign drive.
	Mismatched belts	Replace with matched belts.
	Drive overloaded	Redesign drive.
	Belt slips	Increase tension.
	Sheaves misaligned	Align sheaves.
	Oil or heat condition	Eliminate oil. Ventilate drive.

Motor and Electrical Connections

⚠ WARNING

The motor and connections shall be protected to assure that product and environmental condensation does not come in contact with the electrical connections.

NOTICE

It is the responsibility of the installer to assure that the motor is in compliance with the latest edition of IEC 60204-1 and all electrical connections are performed per IEC 60204-1, this includes overcurrent protection.

Wire the motor and other electrical devices, such as solenoid valves and temperature switch, to the proper voltage and amperage as indicated on the nameplate of the component being wired. Turn the blower by hand after wiring is completed to determine that there are no obstructions and that the blower turns freely. Then, momentarily start the blower to check the direction of rotation.
Figure 4-2 shows direction of airflow in relation to rotor rotation. The airflow direction can be reversed by reversing the appropriate motor leads.

06 OPERATION

GENERAL

⚠ DANGER

The blower is not intended to be used with explosive products or in explosive environments. The blower is not intended to be used in applications that include hazardous and toxic gases. Consult the factory for support.

⚠ WARNING

Do not operate without guards in place.

⚠ WARNING

Maximum operating speed: *Table 4-2* states the maximum operating speed in RPM (rotations per minute), the maximum pressure differential, maximum vacuum and maximum temperature rise. Do not exceed these limits.

Before starting the blower for the first time under power, recheck the installation thoroughly to reduce the likelihood of difficulties. Use the following checklist as a guide, but consider any other special conditions in your installation.

1. Be certain no bolts, rags, or dirt have been left in blower.
2. Be certain that inlet piping is free of debris. If an open outdoor air intake is used, be sure the opening is clean and protected by an inlet filter. This also applies to indoor use.
3. If installation is not recent, check blower leveling, drive alignment, belt tension, and tightness of all mounting bolts.
4. Be certain the proper volume of oil is in the oil reservoir chambers.
5. Be certain the driving motor is properly lubricated and connected through suitable electrical overload devices.
6. With electrical power off and locked out to prevent accidental starting, rotate the blower shaft several times by hand to make sure the blower is rotating freely. Unevenness or tight spots are indicators of a condition that should be corrected before progressing.
7. Check motor rotation by momentarily pushing the START button and then checking the flow direction of the blower. Reverse the motor connections if the flow is in the wrong direction.

Carry out initial operation under “no load” conditions by opening all valves and venting the discharge to the atmosphere, if possible. Then, start the motor briefly, listen for unusual noises, and make sure the blower coasts freely to a stop. If no problem appears, repeat this check and let the motor run slightly longer. If any questions exist, investigate before proceeding.

Assuming all tests are satisfactory, the blower will now be ready for continuous full-load operation. During the first several days, check periodically to make sure all conditions remain acceptable and steady. These checks may be particularly important if the blower is part of a process system where conditions may vary. At the first opportunity, stop the blower and clean or remove the inlet filter. Also recheck leveling, coupling alignment or belt tension, and mounting bolts for tightness.

START-UP CHECKLIST

It is recommended that these start-up procedures be followed in sequence and checked off (☑) in the boxes provided in any of the following cases.

• During initial installation • After any shutdown period	• After maintenance work has been performed • After blower has been moved to a new location

DATES CHECKED:	☐ ☐ ☐
☐☐☐☐	Check the unit for proper lubrication. Proper oil level is critical. ***See Lubrication on page 15***. ***See Recommended Lubricants for Blower and Vacuum Boosters on page 35*** for information on acceptable lubricants for the product.
☐☐☐☐	Check the V-belt drive for proper belt alignment and tension.
☐☐☐☐	Carefully turn the rotors by hand to be certain they do not bind.

⚠ WARNING

Disconnect power. Make certain power is off and locked out before touching any rotating element of the blower, motor, or drive components.

☐☐☐☐	“Bump” the unit with the motor to check rotation (counterclockwise when facing the shaft) and to be certain it turns freely and smoothly.
☐☐☐☐	Start the unit and operate it for 30 minutes at no load. During this time, feel the cylinder for hot spots. If minor hot spots occur, ***see Troubleshooting on page 31.***
☐☐☐☐	Apply the load and observe the operation of the unit for 1 hour.
☐☐☐☐	If minor malfunctions occur, discontinue operation and ***see Troubleshooting on page 31***.

OPERATING

The upper temperature limit for blower operation is measured in the exhaust gas stream with a low-mass thermocouple. When this temperature limit switch is installed, as the temperature exceeds the predetermined temperature, the blower motor will stop and cannot be restarted until the temperature drops below the trip setting of the temperature switch.

⚠ DANGER

The blower is not intended to be used with explosive products or in explosive environments. The blower is not intended to be used in applications that include hazardous and toxic gases. Consult the factory for support.

⚠ WARNING

Physical harm may occur if human body parts are in contact or exposed to the process vacuum. Assure that all connections are protected from human contact.

⚠ WARNING

If rated vacuum or pressure levels are exceeded, process fluids will migrate to other parts of the blower and system.

⚠ CAUTION

Do not touch hot surfaces.

Do not touch the blower while it is in operation and assure blower is cool when not in operation.

⚠ CAUTION

Use of a thermowell insulates the thermocouple. Invalid and delayed readings will result. This can result in ineffective protection devices.

NOTICE

The upper temperature limits are not intended for continuous operation. Consult with factory for detailed information assistance.

⚠ CAUTION

Do not stop the blower if there are high outlet pressures in the outlet piping. Unload the outlet piping prior to shutting down the blower.

Stop the blower by turning off the motor. Isolate the blower from the vacuum system and vent the blower to the atmosphere. Turn off the cooling water, if the blower is water cooled. Stop the backing pump. See the component instruction manual.

METHANE GAS APPLICATIONS

Some sewage gases will adhere to the rotors in a gas blower. If enough sludge from the gas being pumped builds up on the rotors, it destroys the clearances between the rotors. The build-up can cause the blower to clatter and eventually freeze up when the rotors no longer have clearance to turn. This can be easily prevented by periodically flushing the blower with a mixture of 75% kerosene or fuel oil and 25% lubricating oil. The kerosene or fuel oil dissolves the sludge build-up and the lubricating oil coats the rotors to slow the build-up.

Inject the mixture on the inlet side through a valve set to feed 1 gal (3.8 L) of mixture in 15 – 20 minutes. On blowers that are regularly flushed, flushing once a week is sufficient. If the blower is dirty, flush it daily until the hard build-up is removed and then move to a weekly flushing cycle. In very dirty gas installations, vary the cycle to meet the demand.

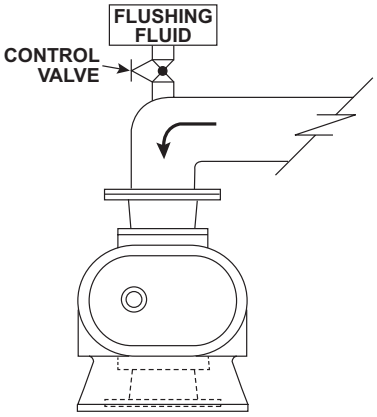


Figure 6-1 – Flushing

WATER-INJECTED BLOWERS

Water injected into the inlet of a blower operating on vacuum service will cool the blower. The water absorbs the heat of compression as it passes through the blower along with the air/gas being compressed. A blower cooled in this manner can operate safely at higher vacuums or higher inlet temperatures than an uncooled blower.

The amount of water required depends on the inlet air/gas temperature, inlet vacuum, water temperature, and maximum discharge temperature desired. Check with the factory or sales representative for more guidance.

Operation

1. Check the oil level in the sight glass of the blower and make sure all fittings are tight.
2. Check the water injection system to make sure water is available.
3. Operate the blower dry for 3 minutes at no load to check for correct rotation and smooth operation.
4. Turn the water on and adjust the flow as recommended for the individual blower. Make sure the water discharges freely from the outlet piping.
5. Apply vacuum and observe operation at the desired inlet condition.

Shutdown

It is possible to shut down the blower for brief periods by relieving the inlet vacuum, shutting off the water, and then stopping the blower.

To avoid rusting during a slightly longer shutdown period, operate the blower under a partial vacuum without the water injection, allowing the blower to heat within safe limits. The heat will tend to drive off residual moisture.

For extended shutdown, oil may be injected into the inlet of the heated blower just prior to shutting down the blower. The oil will provide a protective coating on the internal components. Make sure the water is completely shut off after shutdown.

Special coatings or platings are available to minimize rusting or corrosion in applications where blowers can remain wet.

Always use vertical-flow blowers with two-lobed, plugged rotors. Always orient the system with the blower intake at the top and discharge at the bottom.

⚠ CAUTION

Water injection can cause lime build-up on rotors. Check water supply for hardness. The use of water softeners, other chemicals, or distilled water may be necessary to prevent or remove this build-up. However, due to the wide variations in mineral content, pH, and chemical content of water that can be injected, M-D Pneumatics cannot be responsible for damage which may result should this build-up occur. Units should be inspected regularly to determine any problems.

NOTICE

For liquid injection other than water, consult the factory.

RECOMMENDED SHUTDOWN PROCEDURE TO MINIMIZE RISK OF FREEZING OR CORROSION

When an air piping system has high humidity or moisture, water condensation can occur after the blower is shut down and it begins to cool. Condensation creates an environment favorable to corrosion of the iron internal surfaces and to ice formation in cold weather. Both conditions can close the operating clearances, causing the blower to fail upon future start-up.

The following shutdown procedure minimizes the risk of moisture condensation, corrosion, and freezing.

NOTICE

Care must be taken not to overload or overheat the blower during this procedure.

1. Isolate the blower from the moist system piping, allowing the blower to intake atmospheric air. Operate the blower under a slight load, allowing the blower to heat within safe limits. The heat generated by the blower will quickly evaporate residual moisture.
2. For carpet cleaning applications, after the work is completed, allow the blower to run 3 – 5 minutes with the suction hose and wand attached. The suction hose and wand will provide enough load to the blower to evaporate the moisture quickly.
3. For extended shutdown, inject a small amount of a light lubricating oil such as 3-in-One® or a spray lubricant such as WD-40® into the inlet of the blower just before shutdown *(3-in-One and WD-40 are registered trademarks of WD-40 Company)*. The lubricant will provide an excellent protective coating on the internal surfaces. If using a spray lubricant, take care to prevent the applicator tube from getting sucked into the blower. The applicator tube will damage the blower, likely to a degree where repair would be required.
4. If the blower is being taken out of commission for an extended period of time, ***see Long-Term Storage on page 30***.

07 MAINTENANCE

GENERAL

Regular inspection of the blower and its installation, along with complete checks on operating conditions, will pay dividends in added life and usefulness. Also, service the drive per the manufacturer's instructions and lubricate the coupling or check the belt drive tension. Use thermometers and gauges to make sure that blower operating temperature and pressure remain within allowed limits.

⚠ DANGER

The blower and parts may contain hazardous media. Assure that pump and parts are evacuated of hazardous media prior to servicing.

⚠ CAUTION

The electrical service must be isolated and de-energized prior to maintenance. Apply appropriate procedures to assure electrical supply is de-energized and cannot be inadvertently energized during maintenance.

Assure piping and product is isolated prior to maintenance of blower. Apply appropriate procedures to assure piping and product is isolated and that inadvertent opening of valves cannot occur during maintenance.

⚠ CAUTION

During routine maintenance, inspect and assure that guards are in place and secure.

Pay special attention to lubrication of timing gears and bearings according to the information in ***Lubrication on page 15***.

When a blower is taken out of service, it may require internal protection against rusting or corrosion. The need for such protection must be a matter of judgment based on existing conditions as well as length of downtime. Under atmospheric conditions producing rapid corrosion, protect the blower immediately. ***See Long-Term Storage on page 30***.

REGULAR MAINTENANCE

A well-designed maintenance program will add years of service to the blower.

Check a newly installed blower frequently during the first month of operation, especially lubrication. With the blower at rest, check the oil level in both the gear (drive) end and free (non-drive) end of the blower and add oil as needed. Complete oil changes are recommended every 1,000 - 1,200 operating hours, or more frequently depending on the type of oil and operating temperature. Also change the oil more frequently if pumping corrosive vapors or where excessive operating temperatures are encountered. The following is recommended as a minimum maintenance program.

DAILY	WEEKLY	MONTHLY
1. Check and maintain oil level, and add oil as necessary. 2. Check for unusual noise or vibration (***Troubleshooting on page 31***).	1. Clean all air filters. A clogged air filter can seriously affect the efficiency of the blower and cause overheating and oil usage. 2. Check the relief valve to make sure it is operating properly.	1. Inspect the entire system for leaks. 2. Inspect the condition of the oil and change if necessary. 3. Check drive belt tension and tighten if necessary.

NOTICE

Oil levels should be checked every 24 hours of operation.

Proper oil drain schedules require oil be changed before the contaminant load becomes so great that the lubricating function of the oil is impaired or heavy disposition of suspended contaminants occurs. To check the condition of the oil, drain a sample into a clean container and check for the presence of water or solids. Slight discoloration of the oil should not necessitate an oil change.

SPARE PARTS

Should adjustments or replacement be needed, repairs can often be performed locally as described in this manual after obtaining the required parts. Personnel should have a good background of mechanical experience and be thoroughly familiar with the procedures outlined in this manual. For major repairs not covered in this manual, contact the nearest M-D Pneumatics service representative.

When ordering parts, supply the blower nameplate information, as well as the item number and parts description as per the parts lists and assembly drawings. Repair kits are available for all models. These kits contain all the seals, bearings, O-rings, locks, and special retaining screws necessary for an overhaul. For convenience when ordering parts, complete the **Operating Data Form** included on the inside, back cover of this manual.

In developing a stock of spare parts, consider the following factors:

- The degree of importance in maintaining the blower in a “ready” condition
- The time lag in parts procurement
- Cost
- Shelf life (seals and O-rings)

FACTORY SERVICE AND REPAIR

With proper care, M-D Pneumatics blowers will give years of reliable service. The parts are machined to close tolerances and require special tools by mechanics who are skilled at this work. Should major repairs become necessary, contact the factory for the location of the nearest service facility.

NOTICE

Current regulations require Material Safety Data Sheet to be completed and forwarded to M-D Pneumatics on any unit being returned for any reason which has been handling or involved with hazardous gases or materials. This is for the protection of the employees of M-D Pneumatics who are required to perform service on this equipment. Failure to do so will result in service delays.

NOTICE

When returning a blower to the factory for repair under warranty, please note the factory will not accept any unit that arrives without authorization. Contact Customer Service for return authorization.

LONG-TERM STORAGE

Any time the blower will be stored for an extended period of time, make sure it is protected from corrosion by following this procedure:

1. Spray the interior (lobes, housing, and end plates) with rust preventative. Repeat as conditions dictate and on an at least a yearly basis.
2. Fill both end covers completely full of oil.
3. Firmly attach a prominent tag stating that the end covers are full of oil and must be drained and refilled to proper levels before start-up.
4. Apply a rust-preventative grease to the drive shaft.
5. Spray all exposed surfaces, including the inlet and discharge flanges, with rust preventative.
6. Seal the inlet, discharge, and vent openings. It is not recommended that the blower be set in place, piped to the system, and allowed to remain idle for a prolonged amount of time. If any component is left open to the atmosphere, the rust preventative will escape and lose its effectiveness.
7. During storage, make sure the blower does not experience excessive vibration.
8. Attach a desiccant bag to one of the covers to prevent condensation from occurring inside the blower. Make sure any desiccant bag (or bags) is attached to the covers so that they will be removed before start-up of the blower.
9. Store the blower in an air conditioned and heated building if possible. If air conditioned and heated storage is not possible, make conditions as dry as possible.
10. If possible, rotate the drive shaft by hand at least monthly to prevent seals from setting in one position.

08 TROUBLESHOOTING

Although M-D Pneumatics blowers are well designed and manufactured, problems may occur due to normal wear and the need for readjustment. The following chart lists symptoms that may occur along with probable causes and remedies.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Loss of oil	Gear housing not tightened properly	Tighten gear housing bolts.
	Lip seal failure	Disassemble and replace lip seal.
	Insufficient sealant	Remove gear housing and replace sealant.
	Loose drain plug	Tighten drain plug.
Excessive bearing or gear wear	Improper lubrication	Correct oil level. Replace dirty oil. ***See Lubrication on page 15***.
	Excessive belt tension	Check belt manufacturer's specifications for tension and adjust accordingly.
	Coupling misalignment	Check carefully. Re-align if necessary.
Lack of volume	Slipping belts	Check belt manufacturer's specifications for tension and adjust accordingly.
	Worn lobe clearances	Check for proper clearances. ***See Assembly Clearances on page 33***
	Speed too low	Increase blower speed within limits.
	Obstruction in piping	Check system to ensure an open flow path.
Knocking	Blower out of time	Re-time.
	Distortion due to improper mounting or pipe strains	Check mounting alignment and relieve pipe strains.
	Excessive pressure differential	Reduce to manufacturer's recommended pressure. Examine relief valve and reset if necessary.
	Worn gears	Replace timing gears.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Excessive blower temperature	Too much or too little oil in gear reservoir	Check oil level. ***See Lubrication on page 15***.
	Too low operating speed	Increase blower speed within limits.
	Clogged filter or silencer	Remove cause of obstruction.
	Excessive pressure differential	Reduce pressure differential across the blower.
	Elevated inlet temperature	Reduce inlet temperature.
	Worn lobe clearances	Check for proper clearances. ***See Assembly Clearances on page 33***.
Rotor end or tip drag	Insufficient assembled clearances	Correct clearances..
	Case or frame distortion	Check mounting and pipe strain.
	Excessive operating pressure	Reduce pressure differential.
	Excessive operating temperature	Reduce pressure differential or reduce inlet temperature.
Vibration	Belt or coupling misalignment	Check carefully. Re-align if necessary.
	Lobes rubbing	Check cylinder for hot spots, and then check for lobe contact at these points. Correct clearances.
	Worn bearings or gears	Check condition of gears and bearings. Replace if necessary.
	Unbalanced or rubbing lobes	Possible build-up on casing or lobes, or inside lobes. Remove build-up and restore clearances.
	Driver or blower loose	Check mounting and tighten if necessary.
	Piping resonance	Check pipe supports, check resonance of nearby equipment, and check foundation.

09

ASSEMBLY CLEARANCES

MODEL	LOBES TO END PLATES		LOBE TO HOUSING	INTERLOBE
	GEAR END	FREE END	TIP-PORT	
3202	0.003 – 0.006 in. (0.08 – 0.15 mm)	0.004 – 0.009 in. (0.10 – 0.23 mm)	0.005 – 0.009 in. (0.13 – 0.23 mm)	CENTER TIMED
3204	0.003 – 0.006 in. (0.08 – 0.15 mm)	0.004 – 0.009 in. (0.10 – 0.23 mm)	0.005 – 0.009 in. (0.13 – 0.23 mm)	
3206	0.003 – 0.006 in. (0.08 – 0.15 mm)	0.006 – 0.011 in. (0.15 – 0.28 mm)	0.005 – 0.009 in. (0.13 – 0.23 mm)	
3210	0.003 – 0.006 in. (0.08 – 0.15 mm)	0.010 – 0.015 in. (0.25 – 0.38 mm)	0.005 – 0.009 in. (0.13 – 0.23 mm)	
4006	0.004 – 0.007 in. (0.10 – 0.18 mm)	0.006 – 0.011 in. (0.15 – 0.28 mm)	0.008 – 0.011 in. (0.20 – 0.28 mm)	
4009	0.004 – 0.007 in. (0.10 – 0.18 mm)	0.008 – 0.012 in. (0.20 – 0.30 mm)	0.008 – 0.011 in. (0.20 – 0.28 mm)	
4012	0.004 – 0.007 in. (0.10 – 0.18 mm)	0.010 – 0.014 in. (0.25 – 0.36 mm)	0.008 – 0.011 in. (0.20 – 0.28 mm)	
4014	0.004 – 0.007 in. (0.10 – 0.18 mm)	0.012 – 0.016 in. (0.30 – 0.41 mm)	0.008 – 0.011 in. (0.20 – 0.28 mm)	
5507	0.005 – 0.007 in. (0.13 – 0.18 mm)	0.009 – 0.013 in. (0.23 – 0.33 mm)	0.012 – 0.014 in. (0.30 – 0.36 mm)	
5511	0.005 – 0.007 in. (0.13 – 0.18 mm)	0.012 – 0.016 in. (0.30 – 0.41 mm)	0.012 – 0.014 in. (0.30 – 0.36 mm)	
5514	0.005 – 0.007 in. (0.13 – 0.18 mm)	0.014 – 0.018 in. (0.36 – 0.46 mm)	0.012 – 0.014 in. (0.30 – 0.36 mm)	
5516	0.005 – 0.007 in. (0.13 – 0.18 mm)	0.016 – 0.020 in. (0.41 – 0.51 mm)	0.012 – 0.014 in. (0.30 – 0.36 mm)	
5518	0.005 – 0.007 in. (0.13 – 0.18 mm)	0.018 – 0.023 in. (0.46 – 0.58 mm)	0.012 – 0.014 in. (0.30 – 0.36 mm)	

10 TORQUE CHART

Data shown represents “wet” torque values.

PART DESCRIPTION	TORQUE
CAP SCREW 10-32UNF	3 ft-lb (4 N-m)
CAP SCREW 1/4"-20UNC GR5	6 ft-lb (8 N-m)
CAP SCREW 5/16"-18UNC GR5	13 ft-lb (17 N-m)
CAP SCREW 3/8"-16UNC GR5	23 ft-lb (31 N-m)
CAP SCREW 1/2"-13UNC GR5	57 ft-lb (77 N-m)
CAP SCREW 5/8"-14UNC GR5	113 ft-lb (153 N-m)
CAP SCREW 3/4"-10UNC GR5	200 ft-lb (271 N-m)

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RECOMMENDED LUBRICANTS

RECOMMENDED LUBRICANTS FOR BLOWER AND VACUUM BOOSTERS

M-D Pneumatics positive displacement blowers and vacuum boosters require proper lubrication for bearings, seals and gears to operate effectively and efficiently. Oil is distributed from the oil reservoir to the critical components by means of oil slingers that are attached to the rotor shaft. In certain models of CP Series blowers, a high-performance grease rated for high temperatures is used on the drive-end bearings.

M-D Pneumatics only recommends the use of MD full synthetic lubricants by M-D Pneumatics in its blowers and vacuum boosters. MD lubricants are specifically formulated using unique additives that provide maximum protection and extend the life of your product over mineral oils or semi-synthetic lubricants.

⚠ WARNING

Do not overfill the oil sumps. Overfilling can result in gear damage or oil leaks.

⚠ CAUTION

Units are shipped without oil in the sumps. Ensure adequate oil has been added before operating.

M-D Pneumatics offers oils that are suitable for a wide range of operating temperatures that are based on model, operating speed and discharge temperature of the product.

FOR OXYGEN-ENRICHED SERVICE

Blowers and vacuum boosters operated in oxygen enriched applications should only use non-flammable, PFPE full synthetic lubricants. Blowers and vacuum boosters used in hydrogen service should only use M-D Pneumatics MD full synthetic oil

NOTE: Oxygen-enriched service only applicable for PD Plus blowers and vacuum boosters.

⚠ CAUTION

M-D Pneumatics and Kinney does not accept responsibility for damage caused by use of lubricants that are not recommended by M-D Pneumatics and Kinney.

MD BLOWER & BOOSTER LUBRICANTS SPECIFICATIONS:				
PRODUCTS	**MD ONE**	**MD PLUS**	**MD MAX**	**MD FG**
VISCOSITY INDEX	150	154	157	141
@40°C, CST	99.1	231.7	340.9	99.3
@100°C, CST	14.4	27.6	37.2	13.9
FLASH POINT °F (°C)	510 (266)	480 (249)	491 (255)	515 (268)
POUR POINT °F (°C)	- 44 (-43)	-49 (-45)	-54 (-48)	-60 (-51)

NOTE: MD One Vapor Pressure: (mm Hg) 100ºF <0.00004; 200ºF <0.00018

MD BLOWER & BOOSTER LUBRICANTS OPTIONS					
MD OIL TYPE	**1 QUART**	**1 GALLON**	**5 GALLON**	**55 GALLON BARREL**	**CASE 12 QUARTS**
MD ONE	16444-MD1-Q	16444-MD1-G	16444-MD1-5G	16444-MD1-B	16444-MD1-Q-C
MD PLUS	16444-MD2-Q	16444-MD2-G	16444-MD2-5G	16444-MD2-B	16444-MD2-Q-C
MD MAX	16444-MD3-Q	16444-MD3-G	16444-MD3-5G	16444-MD3-B	16444-MD3-Q-C
MD FG	16444-MD1-Q-FG	16444-MD1-G-FG	16444-MD1-5G-FG	16444-MD1-B-FG	16444-MD1-Q-C-FG

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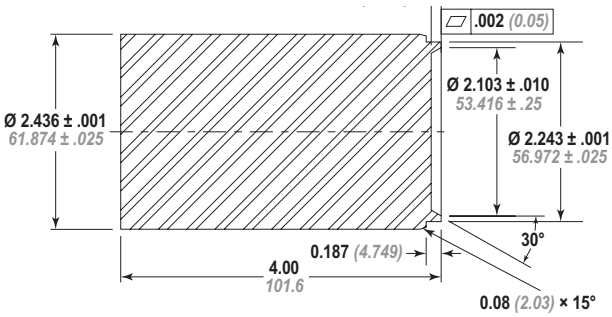
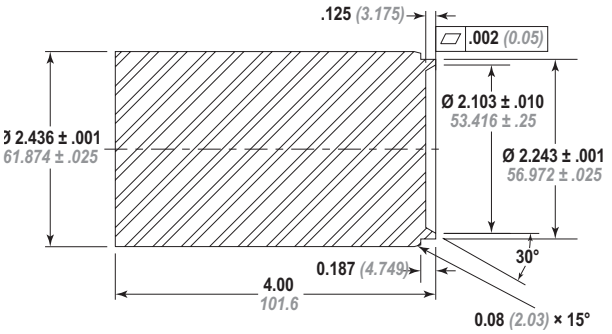
SPECIAL TOOL DRAWINGS



MATL P/N: CR1215RO-0250 × 4.25 *(88.9)* LG
MATL: COLD ROLLED STEEL BAR
Ø 2.50 *(63.5)* OD × 4.25 *(107.95)* LG

TOLERANCES
.XX = ± .01 *(± .03)*
.XXX = ± .005 *(± .05)*
CHAMFERS = ± 2°

Figure 12-1 – 4000 Mechanical Seal Tool (T11549)



MATL P/N: CR1215RO-0250 × 4.25 *(88.9)* LG
MATL: COLD ROLLED STEEL BAR
Ø 2.50 *(63.5)* OD × 4.25 *(107.95)* LG

TOLERANCES
.XX = ± .01 *(± .03)*
.XXX = ± .005 *(± .05)*
CHAMFERS = ± 2°

Figure 12-2 – 4000 Mechanical Seal Tool (T11549)

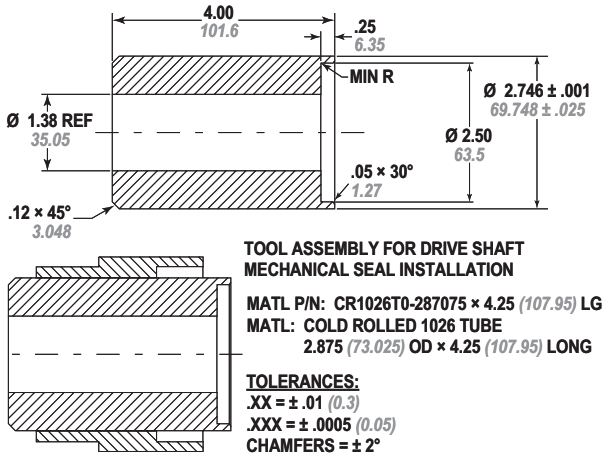


Figure 12-3 – 4000/5500 Seal Pressing Tool (T11449-1)

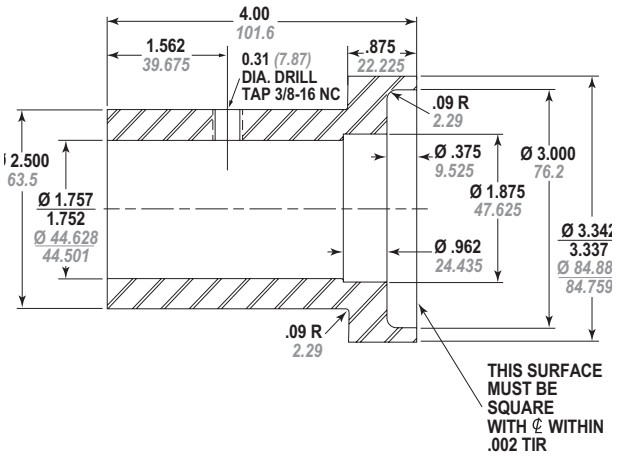


Figure 12-4 – 4000/5500 Pressing Tool for Mechanical Seals

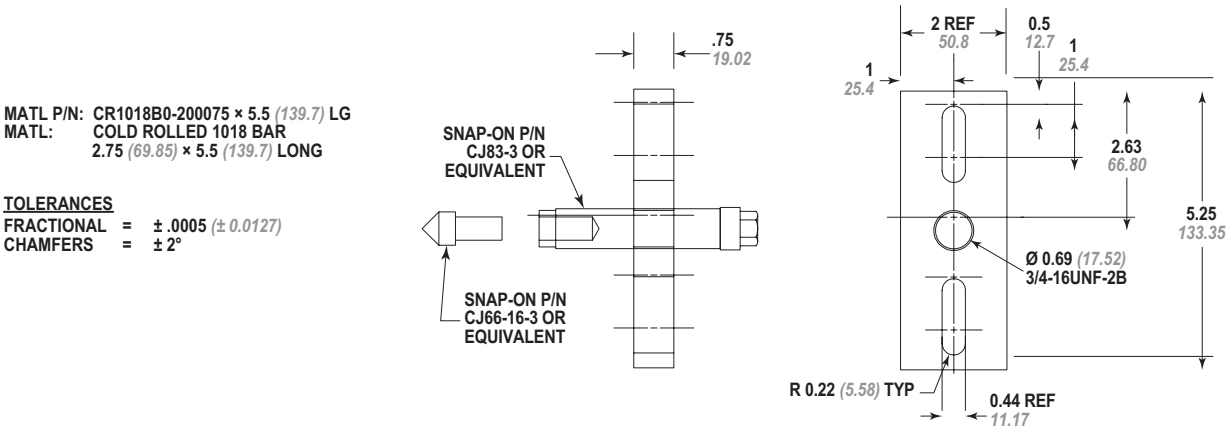


Figure 12-5 – 4000/5500 Gear and EP Tool (T29603)

NOTE: All dimensions are shown in inches and millimeters.

PARTS LIST

Parts List for Model 3200 Series – Standard Seals

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor	2
3	Housing	1
4	End Plate	2
6	Drive End Cover	1
7	Free End Cover	1
8	Timing Gear Set	1
9	Bearing, Drive End	2
10	Bearing, Free End	2
12	Lip Seal	4
13	Lip Seal	1
14	Retainer	4
16	Shim	2
16	Shim	6
16	Shim	2
17	Spacer	1
18	Spacer	1
20	Oil Slinger	1
21	Oil Slinger	1
22	Dowel Pin	0
23	Drive Shaft Key	1
24	Gear Key	2
25	Rotor Shaft Washer	4
26	Cap Screw, Hex HD	12
26	Cap Screw, Hex HD	12
27	Lock Washer	24
28	Gasket	2
29	Cap Screw	4
30	Cap Screw	16
31	Magnetic Pipe Plug	2
37	Breather	2
38	Port Fitting	2
39	Port Fitting Gasket	2
40	Cap Screw	24

ITEM NO.	PART DESCRIPTION	QTY
41	Lock Washer	24
42	Nameplate	1
45	Drive Shaft	1
47	Retaining Ring	1
50	Bearing	1
51	Lab Seal	4
57	Spacer	1
66	Cap Screw	2
67	Spacer	2
70	Oil Gauge	2
85	Pipe Plug	6
98	Pipe Plug	6
121	Pipe Plug	3
123	Bearing Spacer	2
129	Spacer	4
174	Pipe Plug	2
234	Oil Level Tag	2
241	Cap Screw	12
242	Sight Gauge Frame	2
243	Sight Gauge Glass Frame	2
244	Window Gasket	2
245	Frame Gasket	2

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Model 3200 Series – Single Envelope

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor	2
3	Housing	1
4	End Plate	2
6	Drive End Cover	1
7	Free End Cover	1
8	Timing Gear Set	1
9	Bearing, Drive End	2
10	Bearing, Free End	2
13	Lip Seal	1
14	Retainer	4
16	Shim	2
16	Shim	6
16	Shim	2
17	Spacer	1
18	Spacer	1
20	Oil Slinger	1
21	Oil Slinger	1
22	Dowel Pin	0
23	Drive Shaft Key	1
24	Gear Key	2
25	Rotor Shaft Washer	4
26	Cap Screw, Hex HD	12
26	Cap Screw, Hex HD	12
27	Lock Washer	24
28	Gasket	2
29	Cap Screw	4
30	Cap Screw	16
31	Magnetic Pipe Plug	2
37	Breather	2
38	Port Fitting	2
40	Cap Screw	24
41	Lock Washer	24
42	Nameplate	1
45	Drive Shaft	1

ITEM NO.	PART DESCRIPTION	QTY
47	Retaining Ring	1
50	Bearing	1
51	Lab Seal	4
54	Mechanical Seal	4
57	Spacer	1
66	Cap Screw	2
67	Spacer	2
70	Oil Gauge	0
85	Pipe Plug	6
98	Pipe Plug	10
121	Pipe Plug	2
123	Bearing Spacer	2
174	Pipe Plug	4
234	Oil Level Tag	2
241	Cap Screw	12
242	Sight Gauge Frame	2
243	Sight Gauge Glass Frame	2
244	Window Gasket	2
245	Frame Gasket	2

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Model 3200 Series – Double Envelope

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor	2
3	Housing	1
4	End Plate	2
6	Drive End Cover	1
7	Free End Cover	1
8	Timing Gear Set	1
9	Bearing, Drive End	2
10	Bearing, Free End	2
14	Retainer	4
16	Shim	2
16	Shim	6
16	Shim	2
17	Spacer	1
18	Spacer	1
20	Oil Slinger	1
21	Oil Slinger	1
22	Dowel Pin	0
23	Drive Shaft Key	1
24	Gear Key	2
25	Rotor Shaft Washer	4
26	Cap Screw, Hex HD	12
26	Cap Screw, Hex HD	12
27	Lock Washer	24
29	Cap Screw	4
30	Cap Screw	16
31	Magnetic Pipe Plug	2
38	Port Fitting	2
40	Cap Screw	24
41	Lock Washer	24
42	Nameplate	1
45	Drive Shaft	1
50	Bearing	1
51	Lab Seal	4
54	Mechanical Seal	4

ITEM NO.	PART DESCRIPTION	QTY
57	Spacer	1
66	Cap Screw	2
67	Spacer	2
70	Oil Gauge	0
74	Spacer	1
75	O-Ring	1
76	Mechanical Seal	1
77	Spacer	1
82	Washer	1
83	Lock Nut	1
85	Pipe Plug	6
91	Drive Shaft Seal Adapter	1
92	O-Ring	1
93	Cap Screw	4
98	Pipe Plug	10
118	Shim	1
118	Shim	1
121	Pipe Plug	4
123	Bearing Spacer	2
140	O-Ring	1
174	Pipe Plug	4
234	Oil Level Tag	2
241	Cap Screw	12
242	Sight Gauge Frame	2
243	Sight Gauge Glass Frame	2
244	Window Gasket	2
245	Frame Gasket	2

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Model 4000 Series – Standard Seals

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor	2
3	Housing	1
4	End Plate	2
6	Drive End Cover	1
7	Free End Cover	1
8	Timing Gear Set	1
9	Bearing, Drive End	2
10	Bearing, Free End	2
12	Lip Seal	4
13	Lip Seal	1
14	Retainer	2
15	Oil Retainer Ring	4
21	Oil Slinger	1
22	Dowel Pin	6
23	Drive Shaft Key	1
24	Gear Key	2
25	Rotor Shaft Washer	1
26	Cap Screw, Hex HD	28
27	Lock Washer	28
28	Gasket	2
29	Cap Screw	1
30	Cap Screw	4
31	Magnetic Pipe Plug	2
35	Lock Nut	2
36	Washer	2
37	Breather	2
38	Port Fitting	2
39	Port Fitting Gasket	2
40	Cap Screw	28
41	Lock Washer	28
42	Nameplate	1
45	Drive Shaft	1
47	Retaining Ring	1
50	Bearing	1

ITEM NO.	PART DESCRIPTION	QTY
51	Lab Seal	4
61	Bearing Lock Plate	4
62	Cap Screw	8
65	Lock Plate	2
66	Cap Screw	4
68	Dowel Pin	1
69	Cap Screw	1
70	Oil Gauge	2 / –
85	Pipe Plug	4 / 6
98	Pipe Plug	– / 4
121	Pipe Plug	6 / 2
123	Bearing Spacer	2
129	Spacer	4
174	Pipe Plug	2 / –
234	Oil Level Tag	– / 2
241	Cap Screw	– / 12
242	Sight Gauge Frame	– / 2
243	Sight Gauge Glass Frame	– / 2
244	Window Gasket	– / 2
245	Frame Gasket	– / 2

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Model 4000 Series – Single Envelope

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor	2
3	Housing	1
4	End Plate	2
6	Drive End Cover	1
7	Free End Cover	1
8	Timing Gear Set	1
9	Bearing, Drive End	2
10	Bearing, Free End	2
13	Lip Seal	1
14	Retainer	2
15	Oil Retainer Ring	4
21	Oil Slinger	1
22	Dowel Pin	6
23	Drive Shaft Key	1
24	Gear Key	2
25	Rotor Shaft Washer	1
26	Cap Screw, Hex HD	28
27	Lock Washer	28
28	Gasket	2
29	Cap Screw	1
30	Cap Screw	4
31	Magnetic Pipe Plug	2
35	Lock Nut	2
36	Washer	2
37	Breather	2
38	Port Fitting	2
40	Cap Screw	28
41	Lock Washer	28
42	Nameplate	1
45	Drive Shaft	1
47	Retaining Ring	1
50	Bearing	1
51	Lab Seal	4
54	Mechanical Seal	4

ITEM NO.	PART DESCRIPTION	QTY
61	Bearing Lock Plate	4
62	Cap Screw	8
65	Lock Plate	2
66	Cap Screw	4
68	Dowel Pin	1
69	Cap Screw	1
70	Oil Gauge	2 / 6
85	Pipe Plug	4 / 8
98	Pipe Plug	8 / 2
121	Pipe Plug	6 / 2
123	Bearing Spacer	2 / –
174	Pipe Plug	2 / –
234	Oil Level Tag	– / 2
241	Cap Screw	– / 12
242	Sight Gauge Frame	– / 2
243	Sight Gauge Glass Frame	– / 2
244	Window Gasket	– / 2
245	Frame Gasket	– / 2

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Model 4000 Series – Double Envelope

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor	2
3	Housing	1
4	End Plate	2
6	Drive End Cover	1
7	Free End Cover	1
8	Timing Gear Set	1
9	Bearing, Drive End	2
10	Bearing, Free End	2
14	Retainer	2
15	Oil Retainer Ring	4
21	Oil Slinger	1
22	Dowel Pin	6
23	Drive Shaft Key	1
24	Gear Key	2
25	Rotor Shaft Washer	1
26	Cap Screw, Hex HD	28
27	Lock Washer	28
28	Gasket	1
29	Cap Screw	4
30	Cap Screw	2 / 3
31	Magnetic Pipe Plug	2
35	Lock Nut	2
36	Washer	2
38	Port Fitting	28
40	Cap Screw	28 / 8
41	Lock Washer	1
42	Nameplate	1
45	Drive Shaft	1
50	Bearing	4
51	Lab Seal	6
54	Mechanical Seal	4
61	Bearing Lock Plate	8
62	Cap Screw	2
65	Lock Plate	4
66	Cap Screw	1
68	Dowel Pin	1
69	Cap Screw	1
70	Oil Gauge	2

ITEM NO.	PART DESCRIPTION	QTY
74	Spacer	2
75	O-Ring, Viton	2
76	Mechanical Seal	1
77	Drive Shaft Face Seal Sleeve	2
78	Retaining Ring	2
82	Washer	1
83	Lock Nut	1
85	Pipe Plug	7 / 8
86	Shim	1
87	Sleeve	1
88	O-Ring, Viton	1
89	Spacer	1
90	Set Screw	2
91	Drive Shaft Adapter Seal	1
92	O-Ring, Viton	1
93	Cap Screw	4
98	Pipe Plug	8
108	Magnetic Pipe Plug	1 / –
121	Pipe Plug	7 / 3
123	Bearing Spacer	2
140	O-Ring, Viton	1
174	Pipe Plug	2 / –
234	Oil Level Tag	– / 2
241	Cap Screw	– / 12
242	Sight Gauge Frame	– / 2
243	Sight Gauge Glass Frame	– / 2
244	Window Gasket	– / 2
245	Frame Gasket	– / 2

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Model 5500 Series – Standard Seals

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor	2
3	Housing	1
4	End Plate	2
6	Drive End Cover	1
7	Free End Cover	1
8	Timing Gear Set	1
9	Bearing, Drive End	2
10	Bearing, Free End	2
12	Lip Seal	4
13	Lip Seal	1
14	Retainer	2
21	Oil Slinger	1
22	Dowel Pin	6
23	Drive Shaft Key	1
24	Gear Key	2
25	Rotor Shaft Washer	1
26	Cap Screw, Hex HD	28
27	Lock Washer	56
28	Gasket	2
29	Cap Screw	1
30	Cap Screw	6
31	Magnetic Pipe Plug	2
35	Lock Nut	2
36	Washer	2
37	Breather	2
38	Port Fitting	2
39	Port Fitting Gasket	2
40	Cap Screw	28
42	Nameplate	1
45	Drive Shaft	1
46	Ring Adapter	1
47	Retaining Ring	1
50	Bearing	1
51	Lab Seal	4

ITEM NO.	PART DESCRIPTION	QTY
57	Bearing Spacer	1
61	Bearing Lock Plate	6
62	Cap Screw	12
65	Lock Plate	2
66	Cap Screw	4
68	Dowel Pin	1
69	Cap Screw	1
70	Oil Gauge	2 / –
85	Pipe Plug	6 / 4
98	Pipe Plug	– / 4
121	Pipe Plug	2 / –
123	Bearing Spacer	4 / 2
129	Spacer	7 / 4
174	Pipe Plug	– / 5
234	Oil Level Tag	– / 2
241	Cap Screw	– / 12
242	Sight Gauge Frame	– / 2
243	Sight Gauge Glass Frame	– / 2
244	Window Gasket	– / 2
245	Frame Gasket	– / 2

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Model 5500 Series – Single Envelope

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor	2
3	Housing	1
4	End Plate	2
6	Drive End Cover	1
7	Free End Cover	1
8	Timing Gear Set	1
9	Bearing, Drive End	2
10	Bearing, Free End	2
13	Lip Seal	1
14	Retainer	4 / 2
21	Oil Slinger	1
22	Dowel Pin	6
23	Drive Shaft Key	1
24	Gear Key	2
25	Rotor Shaft Washer	1
26	Cap Screw, Hex HD	28
27	Lock Washer	56
28	Gasket	2
29	Cap Screw	1
30	Cap Screw	6
31	Magnetic Pipe Plug	2
35	Lock Nut	2
36	Washer	2
37	Breather	2
38	Port Fitting	2
40	Cap Screw	28
42	Nameplate	1
45	Drive Shaft	1
46	Adapter Ring	1
47	Retaining Ring	1
50	Bearing	1
51	Lab Seal	4
54	Mechanical Seal	4
57	Bearing Spacer	1

ITEM NO.	PART DESCRIPTION	QTY
61	Bearing Lock Plate	6
62	Cap Screw	12
65	Lock Plate	2
66	Cap Screw	4
68	Dowel Pin	1
69	Cap Screw	1
70	Oil Gauge	2 / –
85	Pipe Plug	10 / 8
98	Pipe Plug	– / 4
123	Bearing Spacer	2 / –
174	Pipe Plug	7 / 5
234	Oil Level Tag	– / 2
241	Cap Screw	– / 12
242	Sight Gauge Frame	– / 2
243	Sight Gauge Glass Frame	– / 2
244	Window Gasket	– / 2
245	Frame Gasket	– / 2

NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

Parts List for Model 5500 Series – Double Envelope

ITEM NO.	PART DESCRIPTION	QTY
1	Rotor	2
3	Housing	1
4	End Plate	2
6	Drive End Cover	1
7	Free End Cover	1
8	Timing Gear Set	1
9	Bearing, Drive End	2
10	Bearing, Free End	2
14	Retainer	2
21	Oil Slinger	1
22	Dowel Pin	6
23	Drive Shaft Key	1
24	Gear Key	2
25	Rotor Shaft Washer	1
26	Cap Screw, Hex HD	28
29	Cap Screw	4
30	Cap Screw	2 / 3
31	Magnetic Pipe Plug	2
35	Lock Nut	2
36	Washer	2
38	Port Fitting	28
40	Cap Screw	28 / 8
42	Nameplate	1
45	Drive Shaft	1
50	Bearing	4
51	Lab Seal	6
54	Mechanical Seal	4
57	Bearing Spacer	1
61	Bearing Lock Plate	6
62	Cap Screw	2
65	Lock Plate	4
66	Cap Screw	1
68	Dowel Pin	1
69	Cap Screw	1

ITEM NO.	PART DESCRIPTION	QTY
70	Oil Gauge	2
74	Spacer	2
75	O-Ring, Viton	2
77	Drive Shaft Face Seal Sleeve	2
80	Washer	1 / –
82	Washer	1
83	Lock Nut	1
85	Pipe Plug	7 / 8
86	Shim	1
86	Shim	4
91	Drive Shaft Adapter Seal	1
92	O-Ring, Viton	1
93	Cap Screw	4
98	Pipe Plug	8
123	Bearing Spacer	2
136	Lock Washer	1 / –
140	O-Ring, Viton	1
174	Pipe Plug	2 / –
224	Oil Retainer Plate	4 / 1
225	Cap Screw	4
234	Oil Level Tag	– / 2
241	Cap Screw	– / 12
242	Sight Gauge Frame	– / 2
243	Sight Gauge Glass Frame	– / 2
244	Window Gasket	– / 2
245	Frame Gasket	– / 2
255	Roll Pin	2 / –

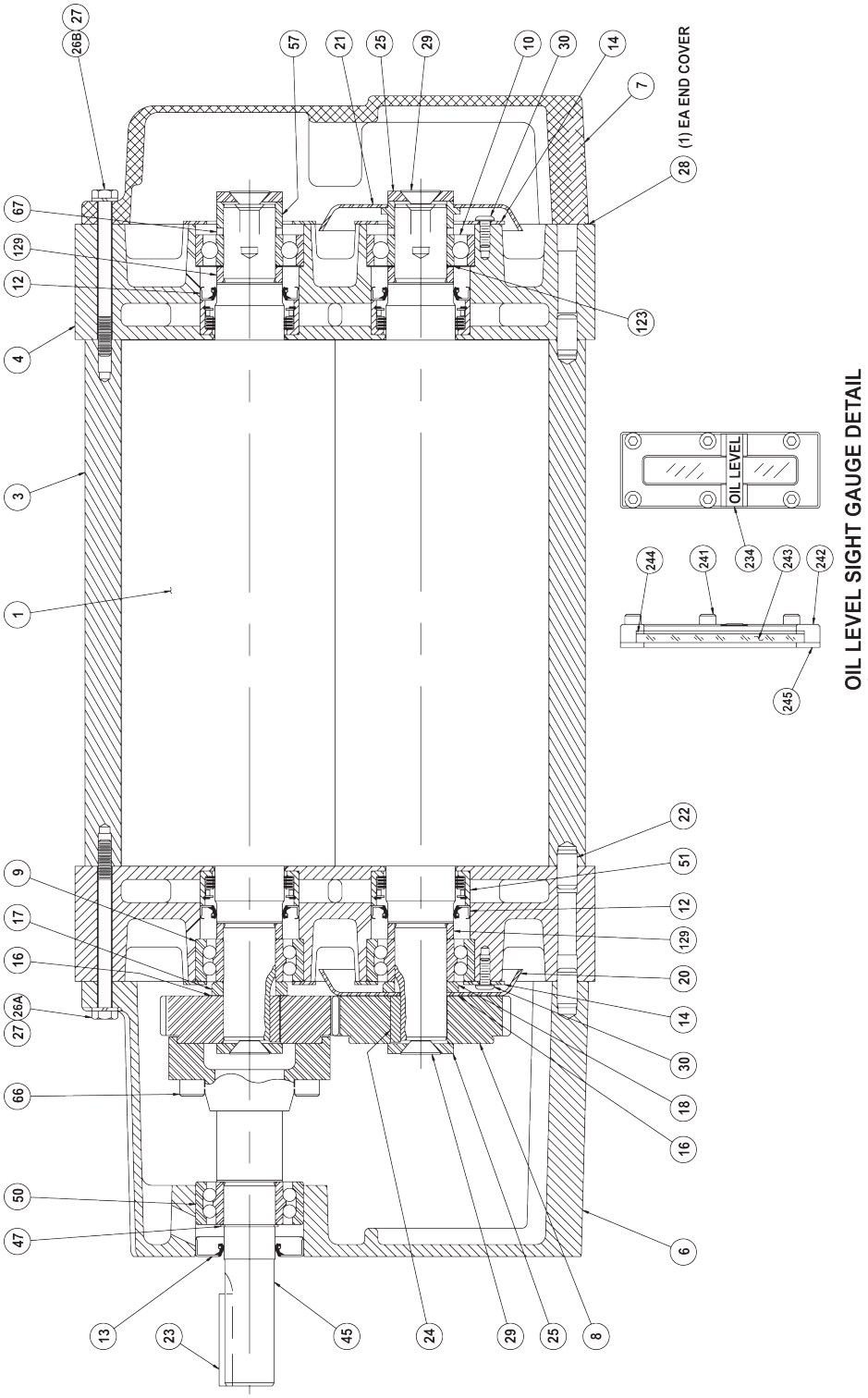
NOTES:

- QUANTITIES SHOWN ARE MAXIMUM VALUES. QUANTITIES MAY VARY BETWEEN BLOWER.

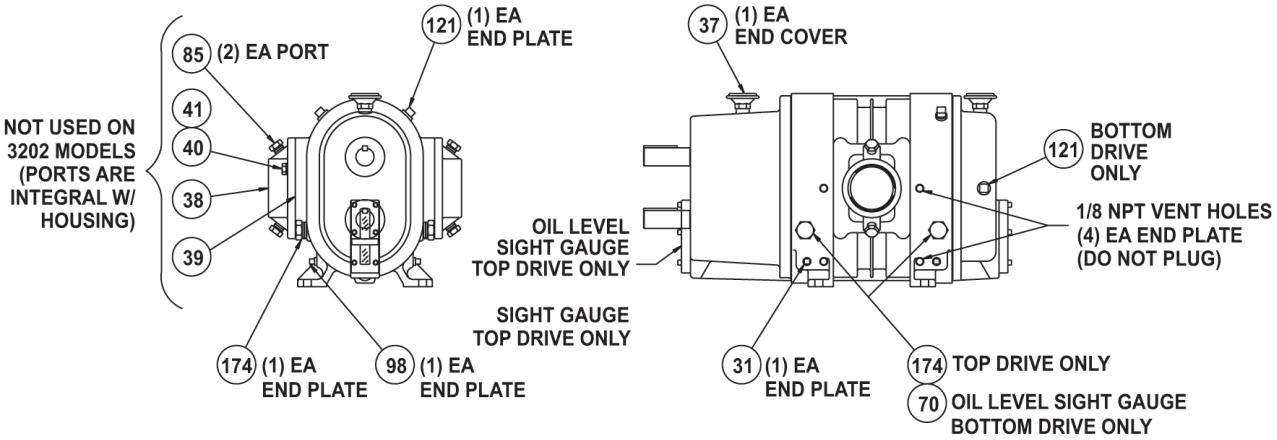
PARTS KITS ARE AVAILABLE. CONSULT AUTHORIZED REPRESENTATIVE FOR PART NUMBERS.

ASSEMBLY DRAWINGS

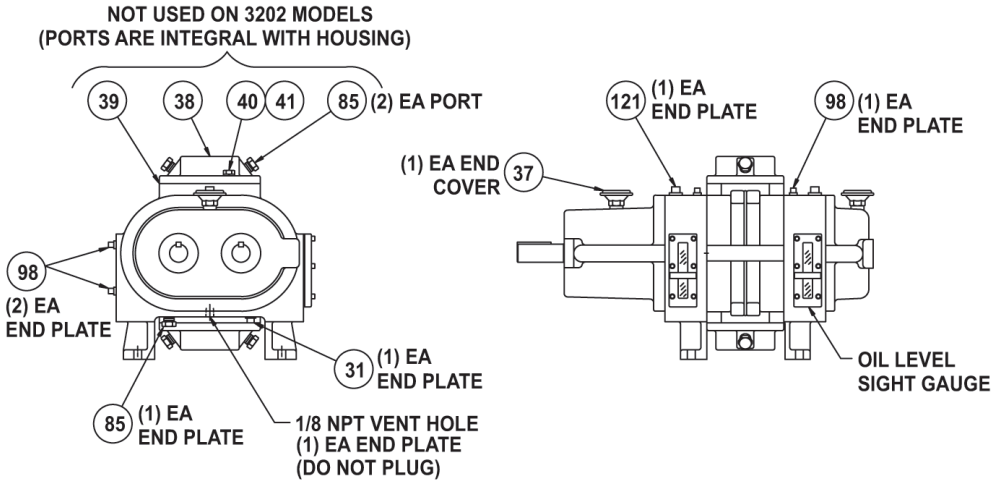
Model 3200 – Standard Seals – Cutaway View



Model 3200 – Standard Seals – Side and End Views

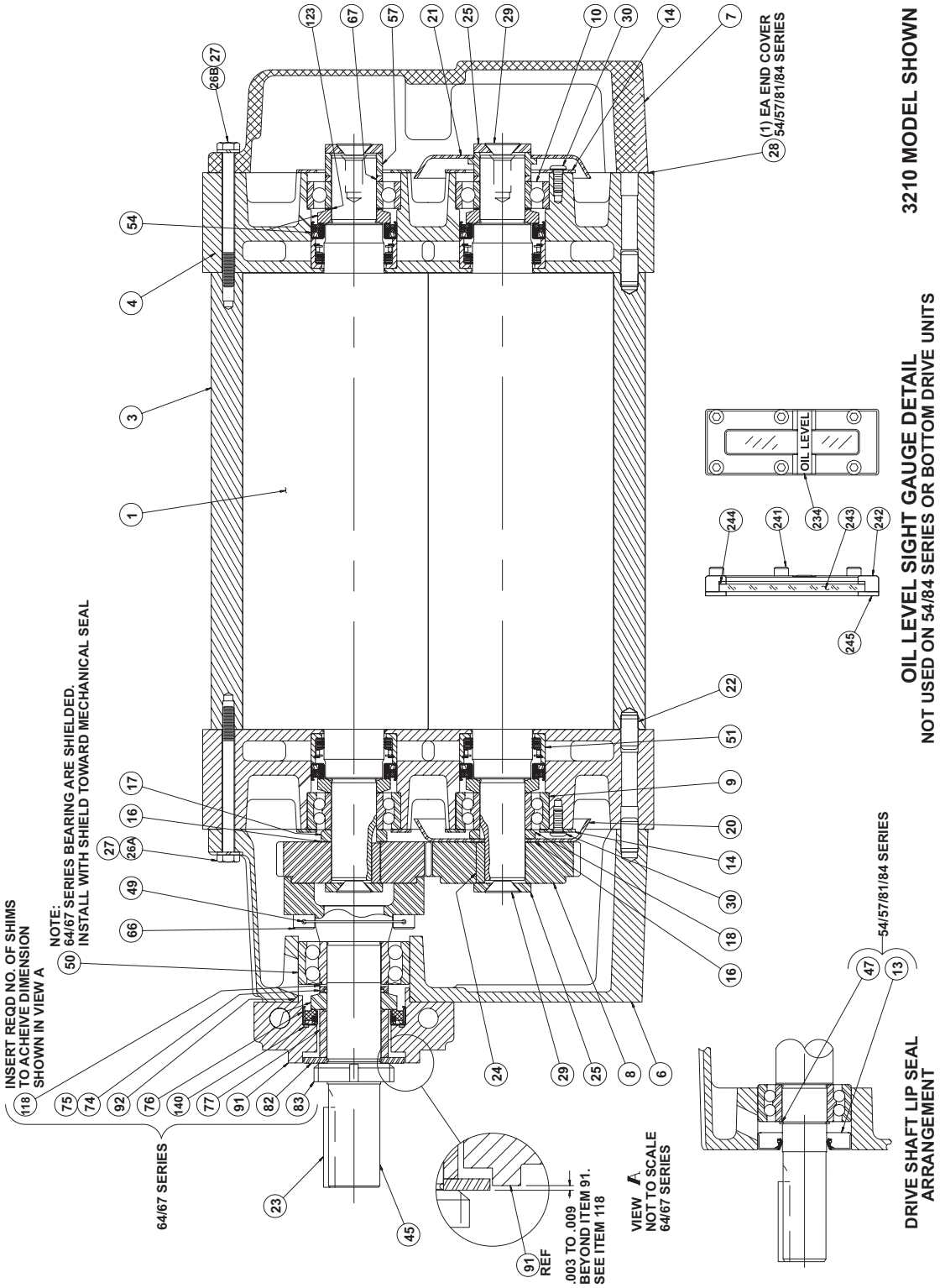


HORIZONTAL STANDARD SEALS SERIES

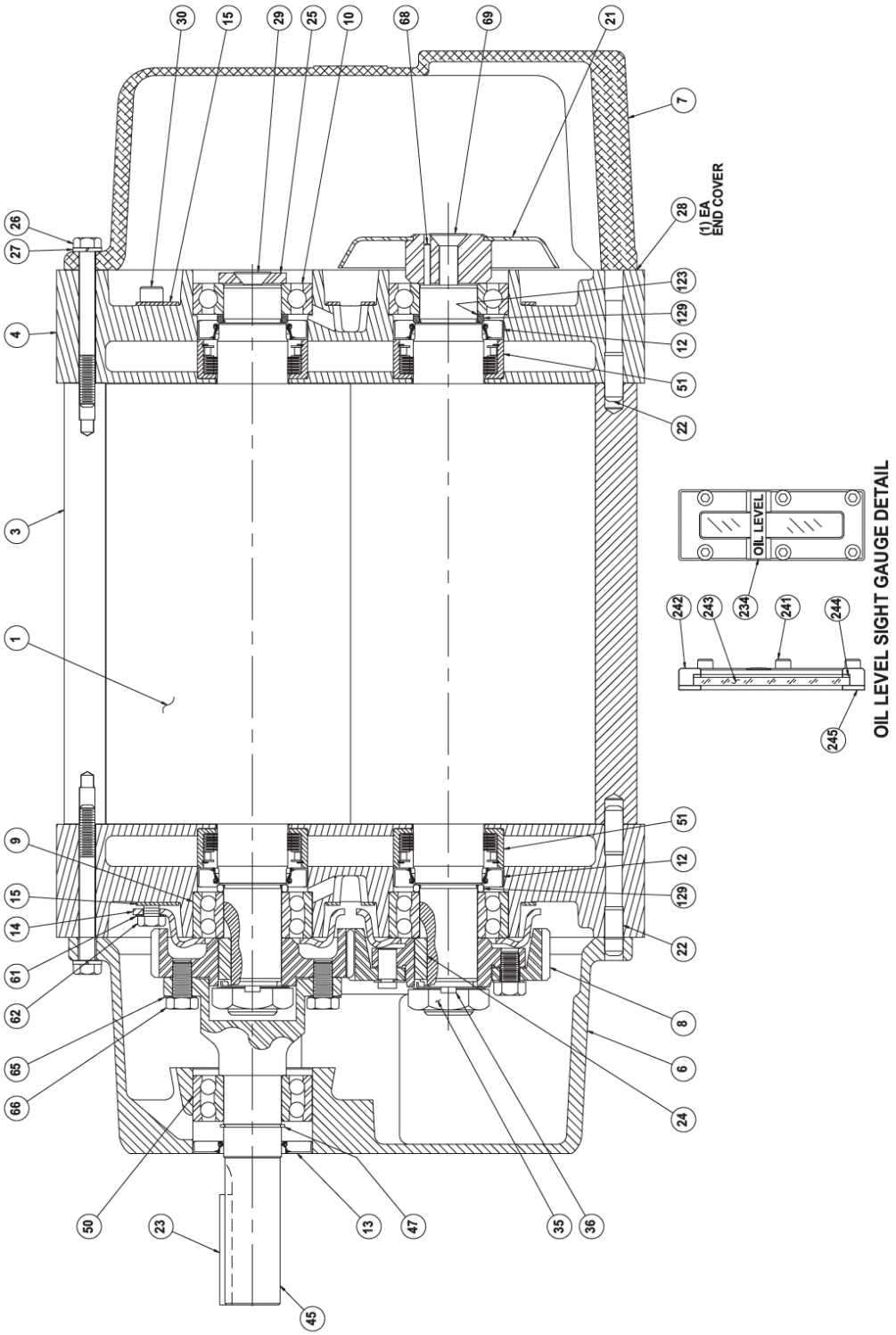


VERTICAL STANDARD SEALS SERIES

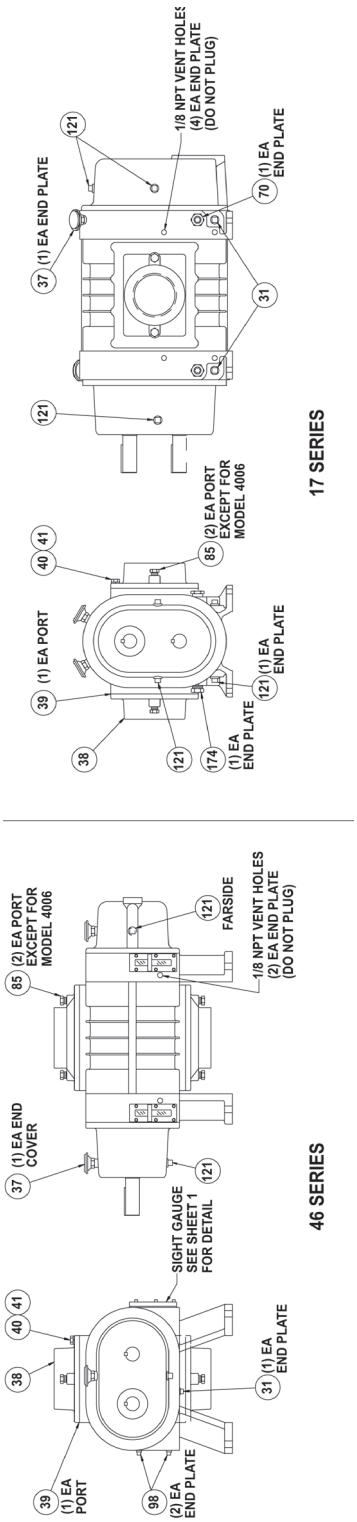
Model 3200 – 54/57/64/67/81/84 – Cutaway View



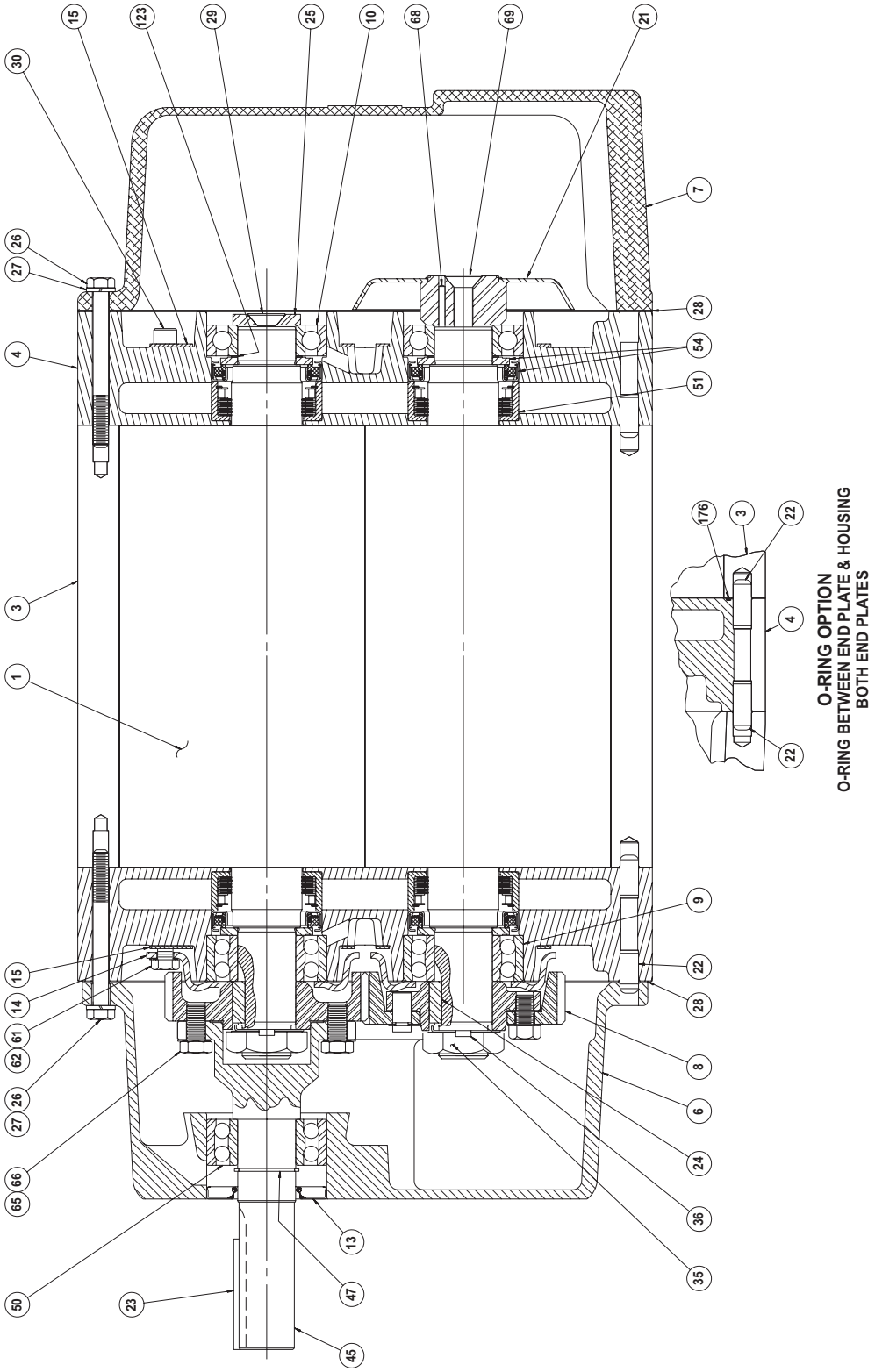
Model 4000 – Standard Seal – Cutaway Views



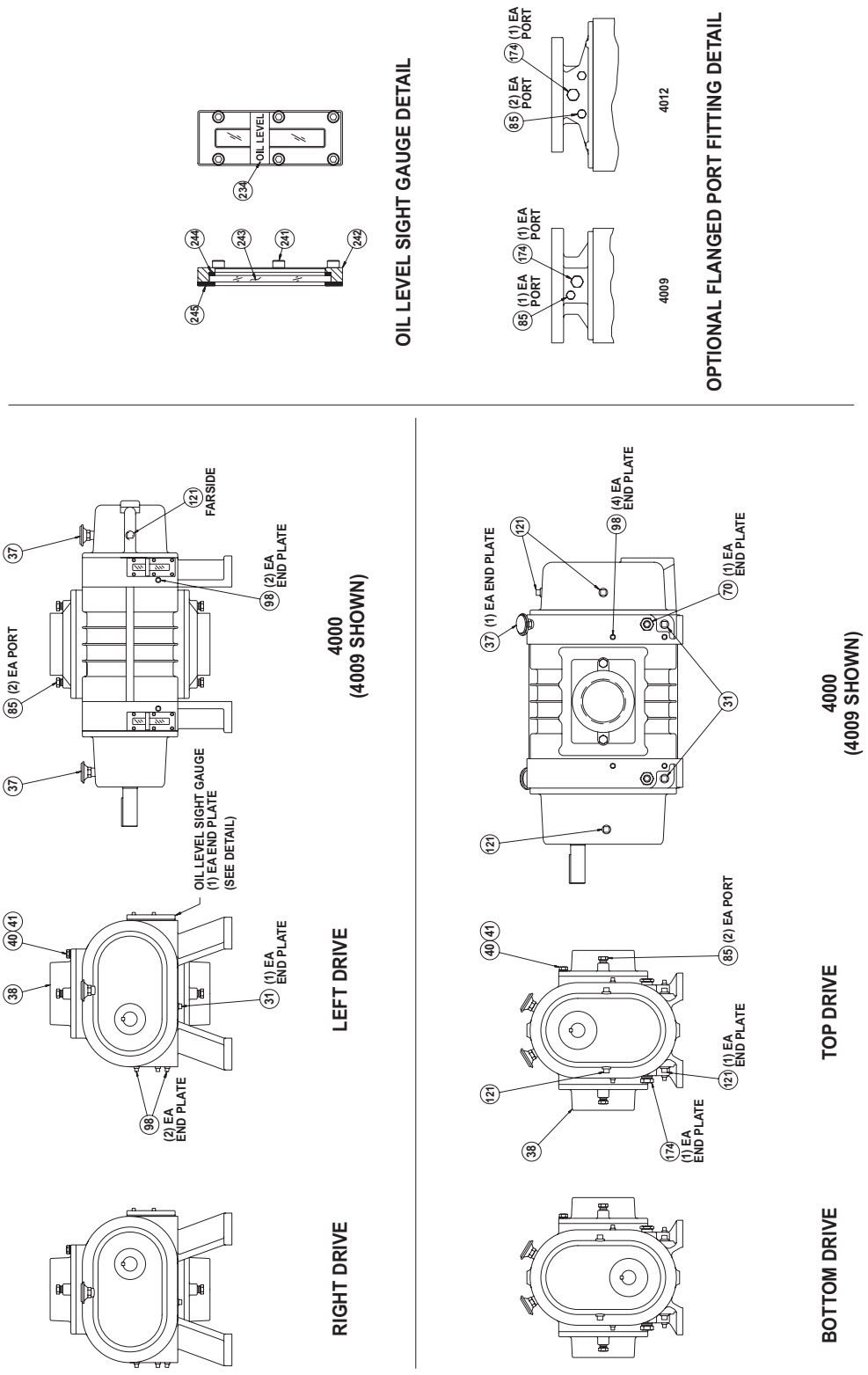
Model 4000 – Lip-Labyrinth – Side and End Views



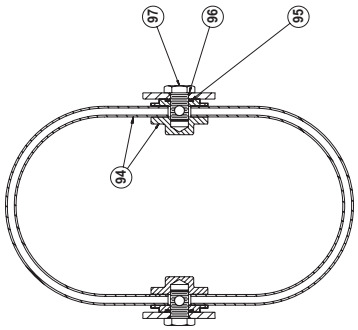
Model 4000 – Single Envelope – Cutaway View



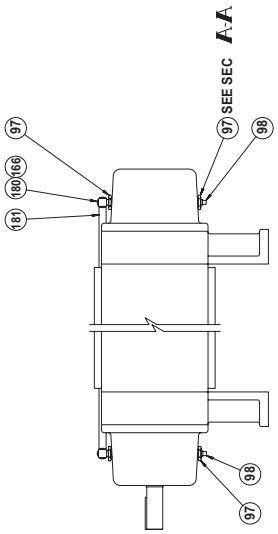
Model 4000 – Single Envelope – Side and End Views



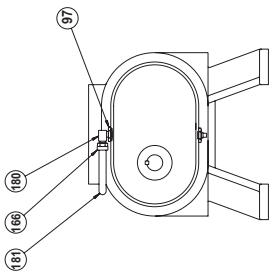
Model 4000 – Single Envelope (Cooling Coil Option) – Side and End Views

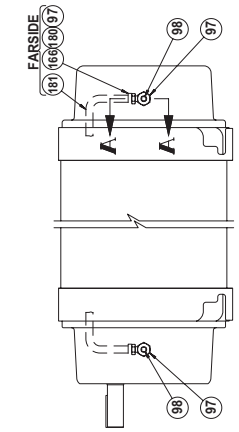


COOLING COIL OPTION

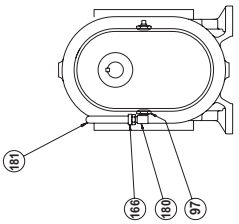


VERTICAL FLOW

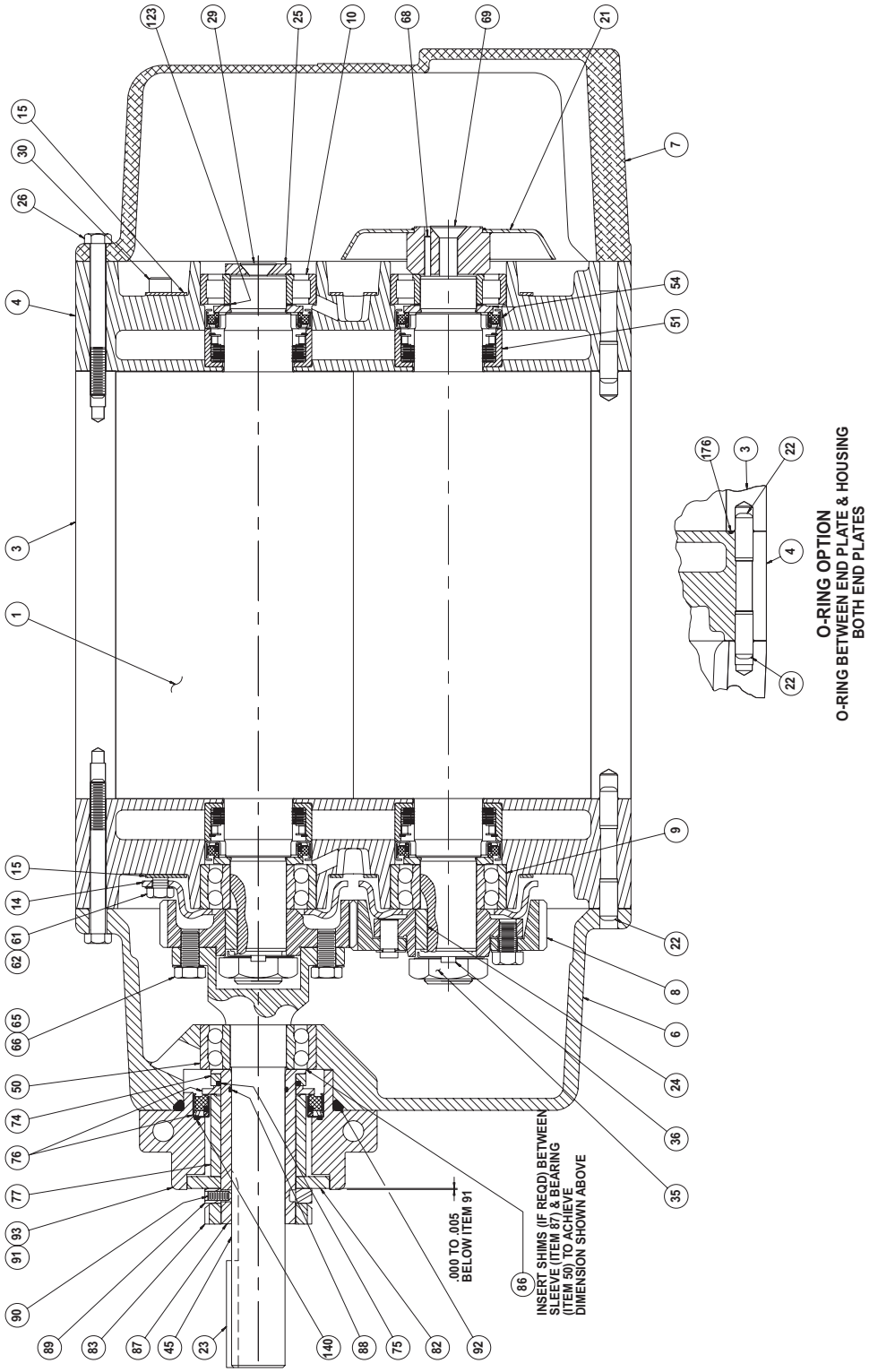




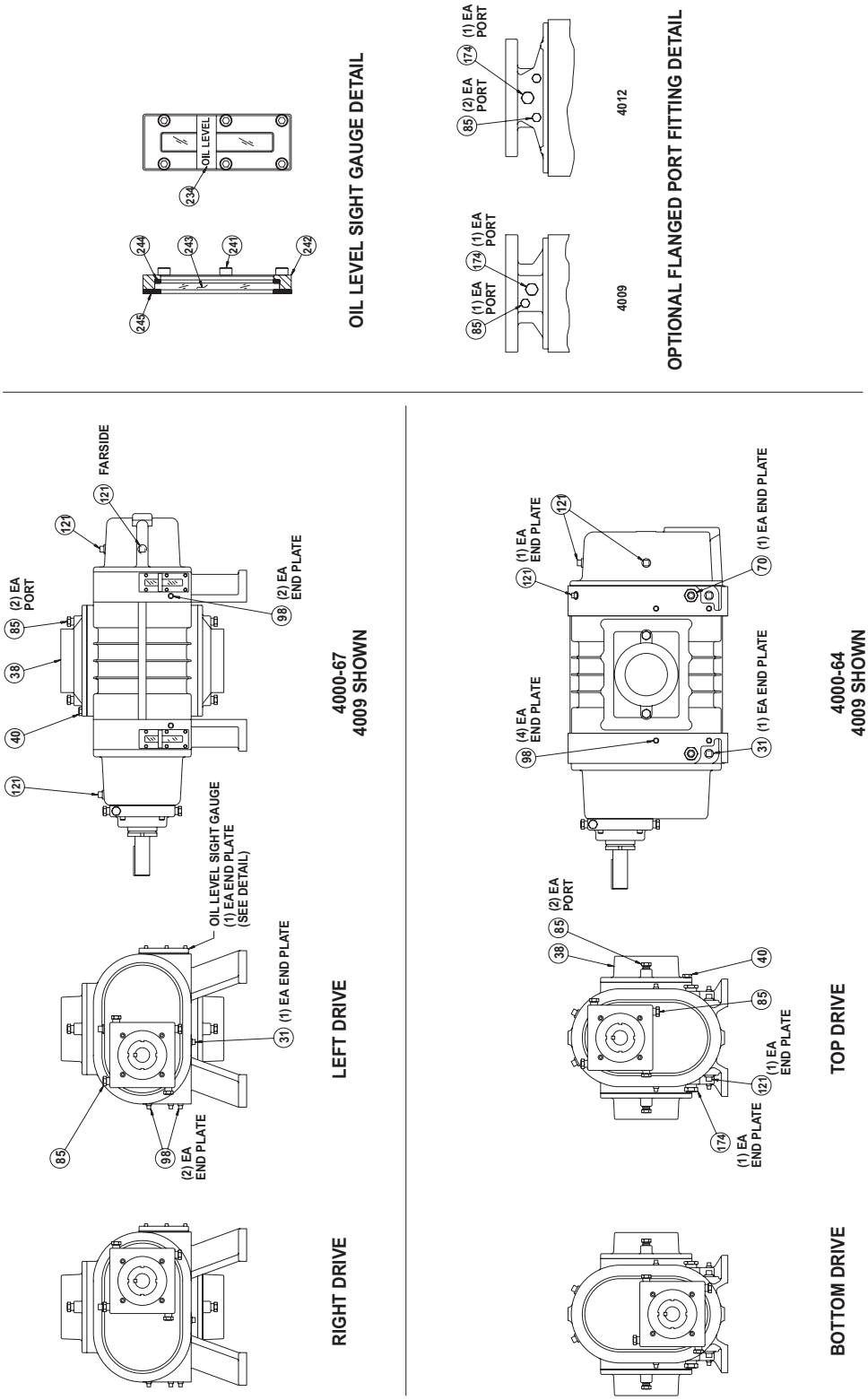
HORIZONTAL FLOW



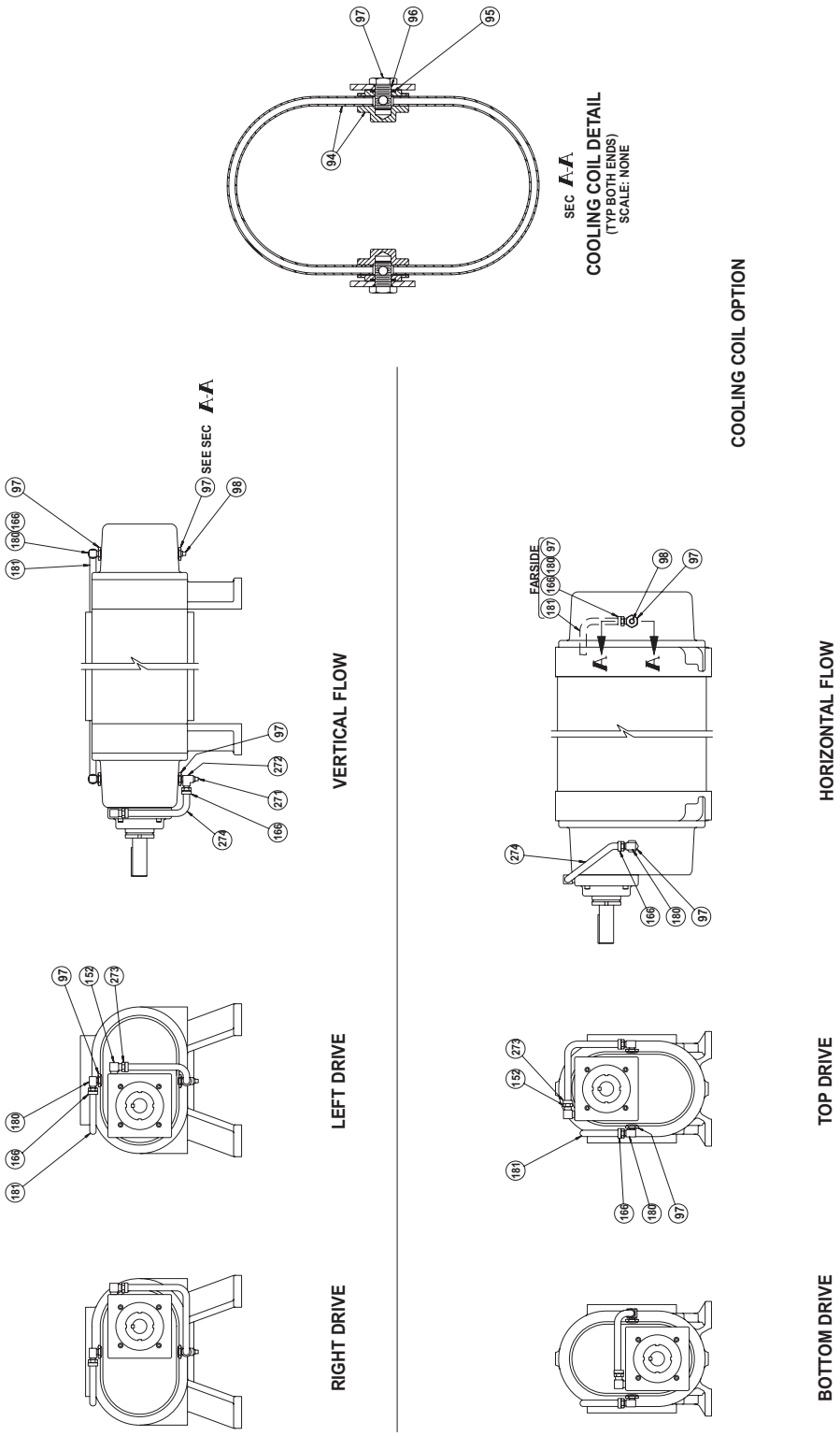
Model 4000 – Double Envelope – Cutaway View



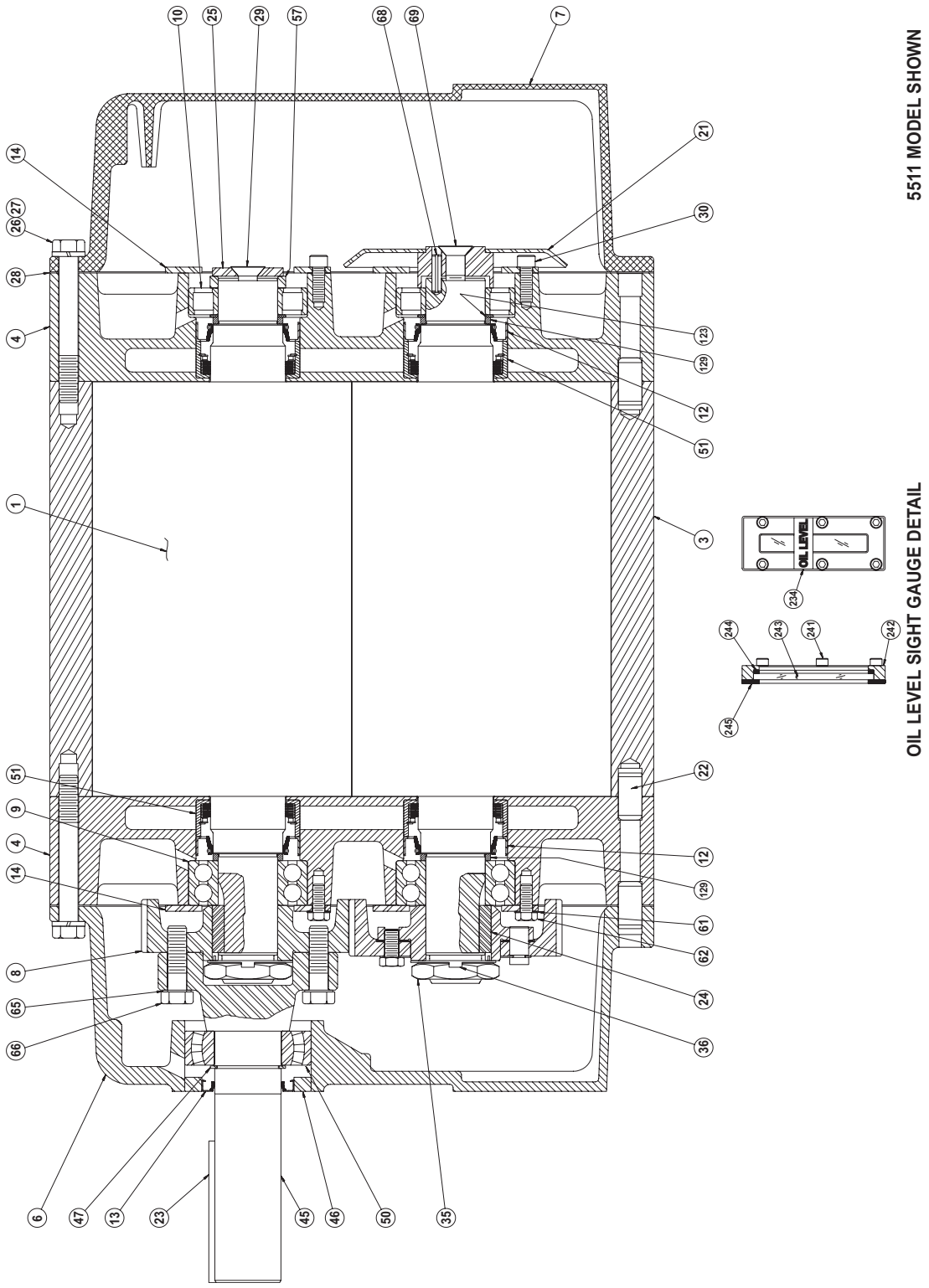
Model 4000 – 64-67-68 – Side and End Views



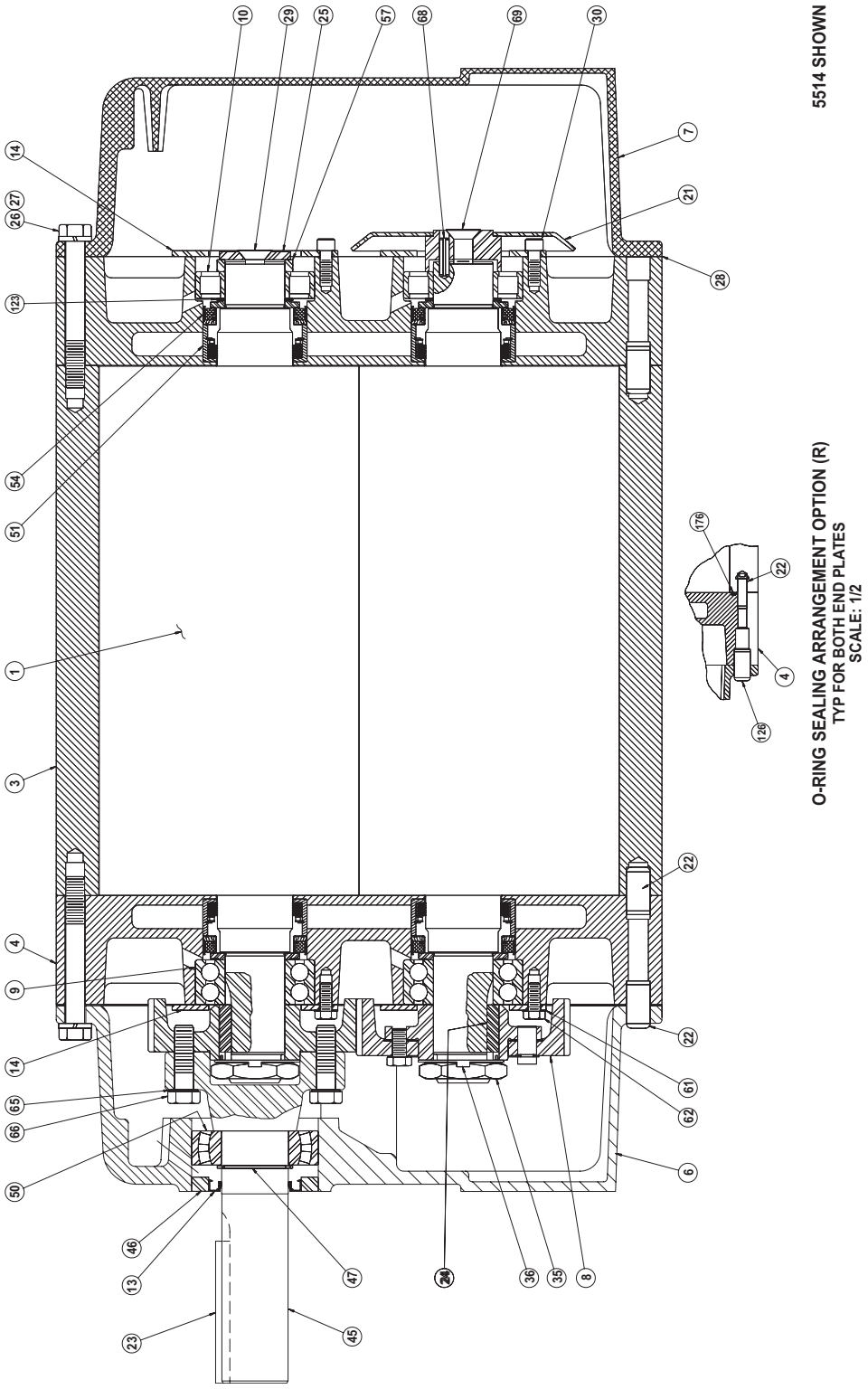
Model 4000 – 64-67-68 (Cooling Coil Option) – Side and End Views



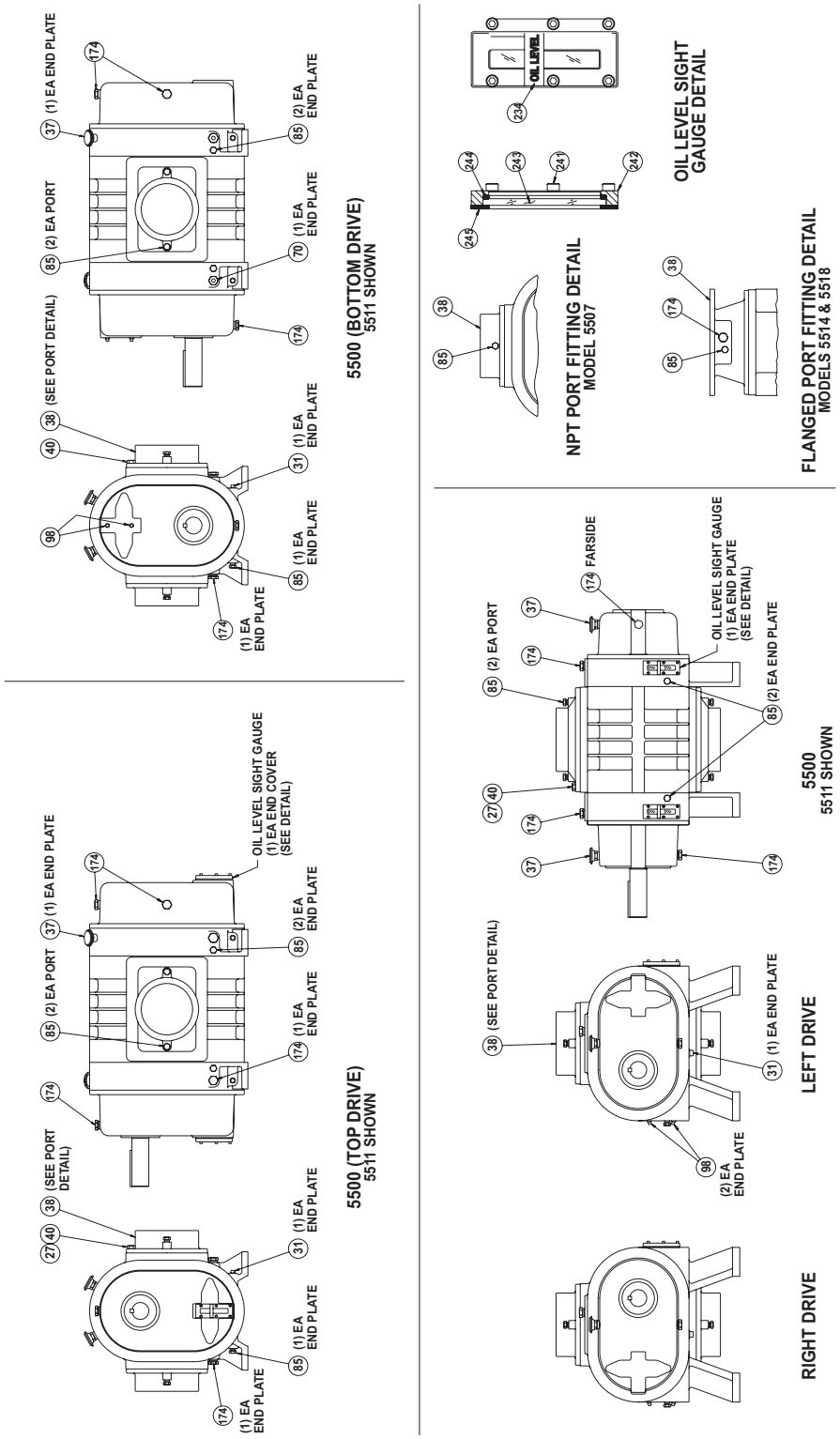
Model 5500 – Standard Seal – Cutaway View



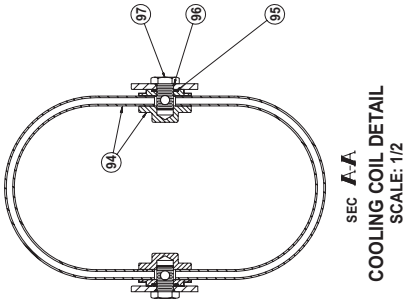
Model 5500 – Single Envelope – Cutaway View

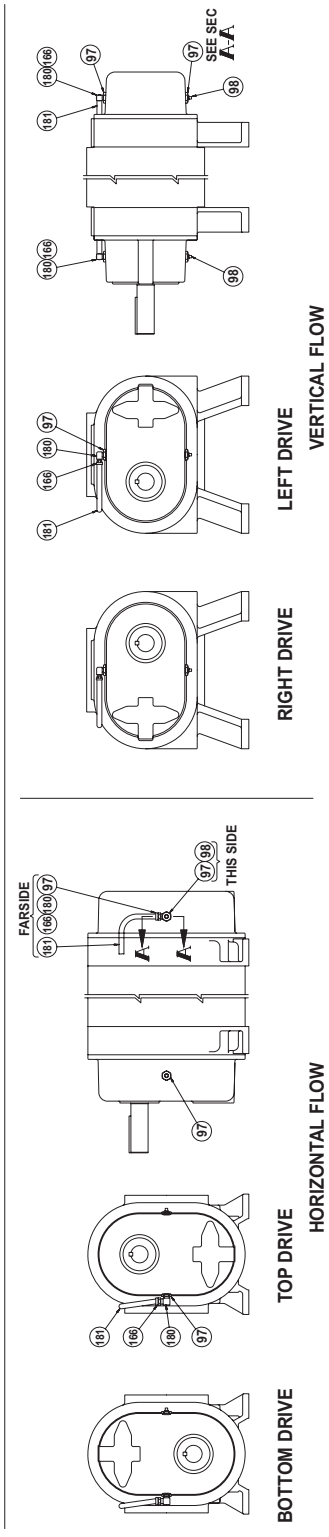


Model 5500 – Single Envelope – Side and End Views

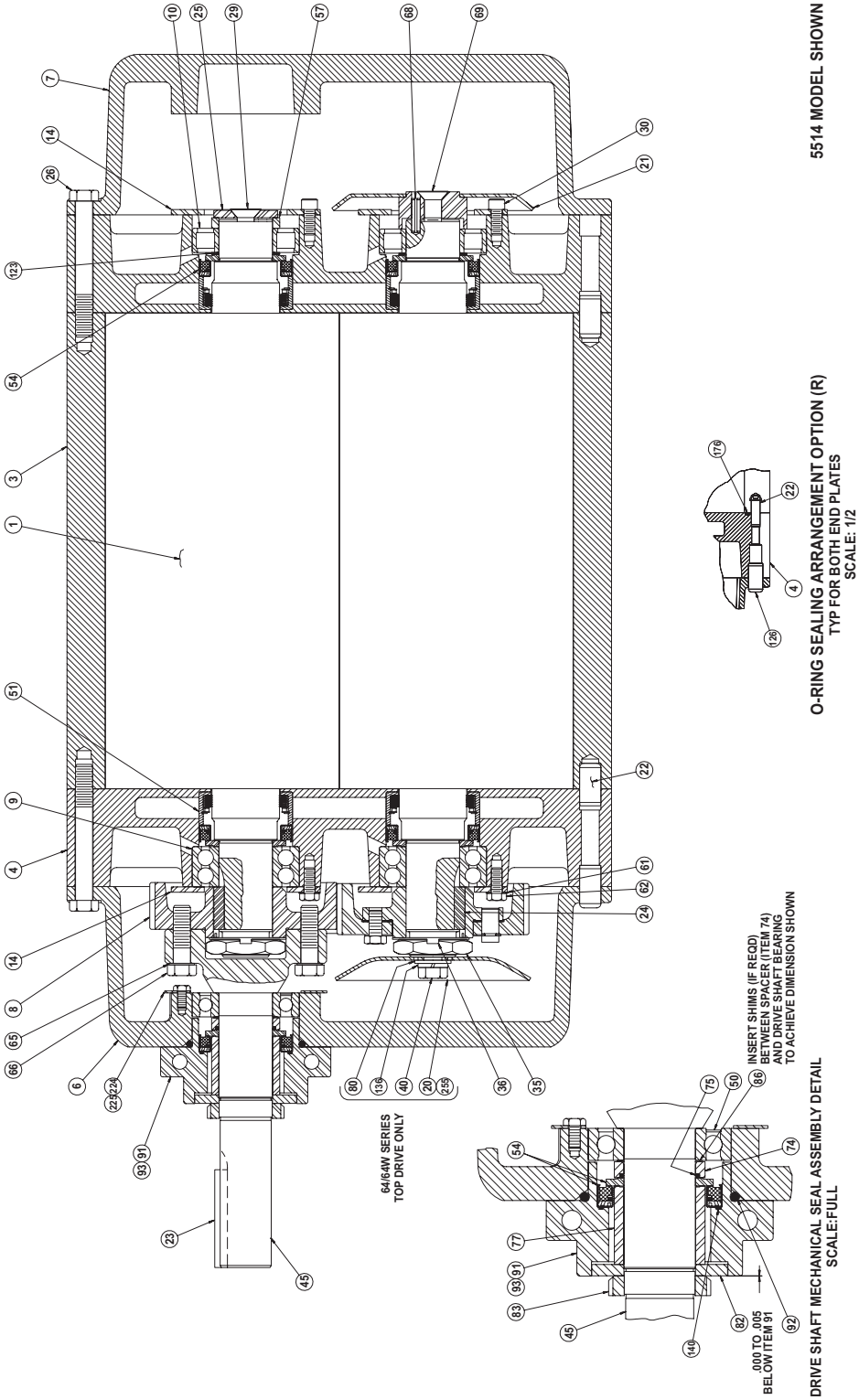


Model 5500 – Single Envelope (Cooling Coil Option) – Side And End Views

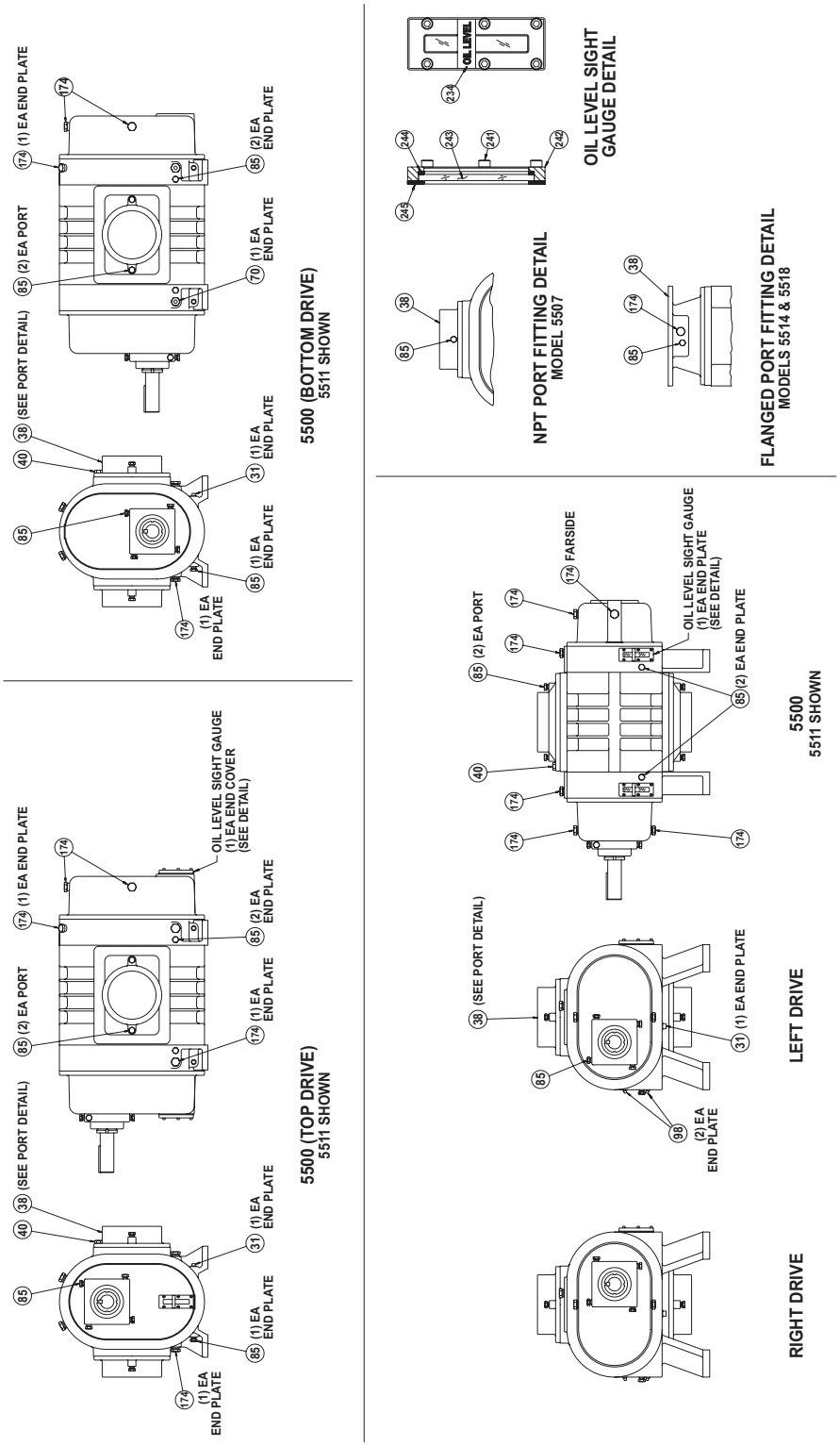




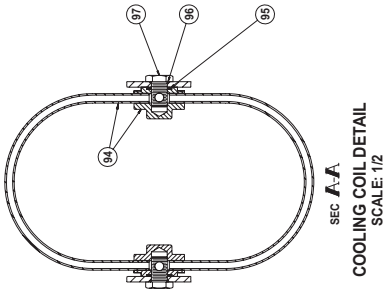
Model 5500 – Double Envelope – Cutaway View

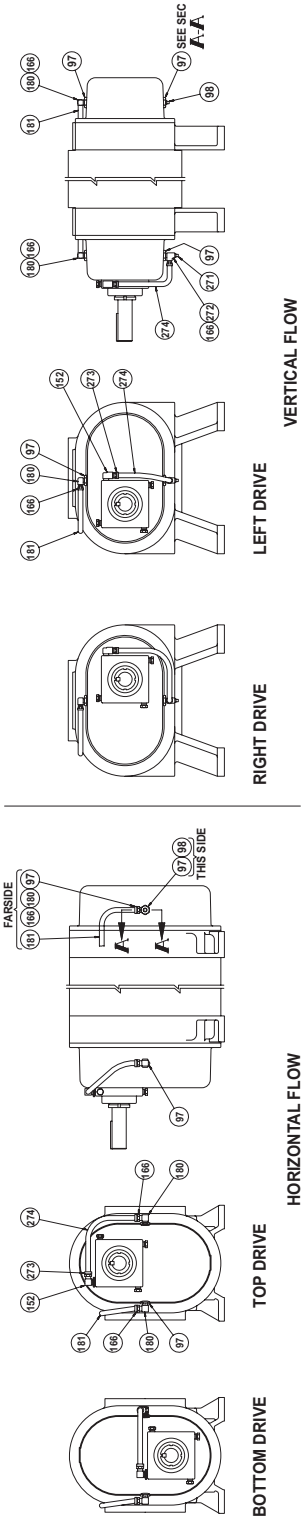


Model 5500 – Double Envelope – Side and End Views



Model 5500 – Double Envelope (Cooling Coil Option) – Side and End Views





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WARRANTY – BLOWER PRODUCTS

Subject to the terms and conditions hereinafter set forth and set forth in General Terms of Sale, M-D Pneumatics (the Seller) warrants products and parts of its manufacture, when shipped, and its work (including installation and start-up) when performed, will be of good quality and will be free from defects in material and workmanship. This warranty applies only to Seller's equipment, under use and service in accordance with seller's written instructions, recommendations and ratings for installation, operating, maintenance and service of products, for a period as stated in the table below. Because of varying conditions of installation and operation, all guarantees of performance are subject to plus or minus 5% variation. (Non-standard materials are subject to a plus or minus 10% variation)

PRODUCT TYPE	TYPE OF APPLICATION	
	ATMOSPHERIC AIR OR PROCESS AIR WITHOUT LIQUIDS PRESENT	PROCESS GASES OTHER THAN AIR, OR ANY LIQUID INJECTED APPLICATION
New *(Qx™ models only)*	30 months from date of shipment, or 24 months after initial startup date, whichever occurs first.	Consult Factory
New *(all other models)*	24 months from date of shipment, or 18 months after initial startup date, whichever occurs first	18 months from date of shipment, or 12 months after initial startup date, whichever occurs first
Repair	12 months from date of shipment, or remaining warranty period, whichever is greater	12 months from date of shipment, or remaining warranty period, whichever is greater

THIS WARRANTY EXTENDS ONLY TO BUYER AND/OR ORIGINAL END USER, AND IN NO EVENT SHALL THE SELLER BE LIABLE FOR PROPERTY DAMAGE SUSTAINED BY A PERSON DESIGNATED BY THE LAW OF ANY JURISDICTION AS A THIRD PARTY BENEFICIARY OF THIS WARRANTY OR ANY OTHER WARRANTY HELD TO SURVIVE SELLER'S DISCLAIMER.

All accessories furnished by Seller but manufactured by others bear only that manufacturer's standard warranty.

All claims for defective products, parts, or work under this warranty must be made in writing immediately upon discovery and, in any event within one (1) year from date of shipment of the applicable item and all claims for defective work must be made in writing immediately upon discovery and in any event within one (1) year from date of completion thereof by Seller. Unless done with prior written consent of Seller, any repairs, alterations or disassembly of Seller's equipment shall void warranty. Installation and transportation costs are not included and defective items must be held for Seller's inspection and returned to Seller's Ex-works point upon request.

THERE ARE NO WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OF PURPOSE.

After Buyer's submission of a claim as provided above and its approval, Seller shall at its option either repair or replace its product, part, or work at the original Ex-works point of shipment, or refund an equitable portion of the purchase price.

The products and parts sold hereunder are not warranted for operation with erosive or corrosive material or those which may lead to build up of material within the product supplied, nor those which are incompatible with the materials of construction. The Buyer shall have no claim whatsoever and no product or part shall be deemed to be defective by reason of failure to resist erosive or corrosive action nor for problems resulting from build-up of material within the unit nor for problems due to incompatibility with the materials of construction.

Any improper use, operation beyond capacity, substitution of parts not approved by Seller, or any alteration or repair by others in such manner as in Seller's judgment affects the product materially and adversely shall void this warranty.

No employee or representative of Seller other than an Officer of the Company is authorized to change this warranty in any way or grant any other warranty. Any such change by an Officer of the Company must be in writing.

The foregoing is Seller's only obligation and Buyer's only remedy for breach of warranty, and except for gross negligence, willful misconduct and remedies permitted under the General Terms of Sale in the sections on CONTRACT PERFORMANCE, INSPECTION AND ACCEPTANCE and the PATENTS Clause hereof, the foregoing is BUYER'S ONLY REMEDY HEREUNDER BY WAY OF BREACH OF CONTRACT, TORT OR OTHERWISE, WITHOUT REGARD TO WHETHER ANY DEFECT WAS DISCOVERED OR LATENT AT THE TIME OF DELIVERY OF THE PRODUCT OR WORK. In no event shall Buyer be entitled to incidental or consequential damages. Any action for breach of this agreement must commence within one (1) year after the cause of action has occurred.

May 2008

OPERATING DATA FORM / PRODUCT REGISTRATION

It is to the user's advantage to have the requested data filled in below and available in the event a problem should develop in the blower or the system. This information is also helpful when ordering spare parts.

Model No. _____ V-Belt Size _____ Length _____

Serial No. _____ Type of Lubrication _____

Startup Date _____ _____

Pump RPM _____ Operating Vacuum _____

Pump Sheave Diameter _____ Any other Special Accessories Supplied or in use:

Motor Sheave Diameter _____ _____

Motor RPM _____ HP _____ _____

NOTES: _____

_____

_____

_____

IMPORTANT

All blowers manufactured by M-D Pneumatics are date coded at time of shipment. In order to assure you of the full benefits of the product warranty, please complete, tear out and return the product registration card. You may also register your product online at www.mdpneumatics.com or contact Customer Service.

M-D Pneumatics®

For Service & Repair, Technical Support, or Product Sales contact:

M-D Pneumatics
4840 West Kearney Street
Springfield, Missouri USA 65803-8702
O 417.865.8715 800.825.6937
F 417.865.2950
www.mdpneumatics.com

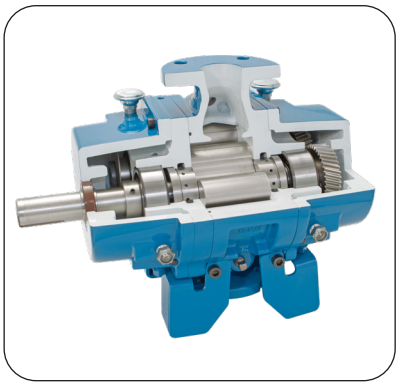
MEMBER OF CAGI Compressed Air & Gas Institute

Manual 2006 Rev C p/n 002006 0000
04/21

Manual 2010 Rev B p/n 002010 0000

WARNING: Do Not Operate Before Reading Manual

Qx
OPERATOR'S MANUAL



Models
3200 4600 6000

Disclaimer Statement:
All information, illustrations and specifications in this manual are based on the latest information available at the time of publishing. The illustrations used in this manual are intended as representative reference views only. Products are under a continuous improvement policy. Thus, information, illustrations and/or specifications to explain and or exemplify a product, service or maintenance improvement may be changed at any time without notice.

Product information and specifications subject to change.

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Introduction **1**

Safety **2**

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01 INTRODUCTION

CONGRATULATIONS on the purchase of a new **Qx® Rotary Positive Displacement Air Blower** from **M-D Pneumatics®**. Please examine the blower for shipping damage, and if any damage is found, report it immediately to the carrier. If the blower is to be installed at a later date, make sure it is stored in a clean, dry location and rotated regularly. Make sure covers are kept on all openings. If the blower is stored outdoors, be sure to protect it from weather and corrosion.

Qx blowers are built to exacting standards and, if properly installed and maintained, will provide many years of reliable service. Read and follow every step of these instructions when installing and maintaining the blower.

⚠ WARNING

Serious injury can result from operating or repairing this machine without first reading the operating manual and taking adequate safety precautions.

NOTE: Record the blower model and serial number of the machine in the OPERATING DATA FORM on the inside back cover of this manual. Use this identification on any replacement part orders, or if service or application assistance is required.

02

SAFETY

GRAPHIC CONVENTIONS USED IN THIS MANUAL

The following hazard levels are referenced within this manual:

⚠ DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a situation that can cause damage to the engine, personal property, and/or the environment or cause the equipment to operate improperly.

NOTE: Indicates a procedure, practice, or condition that should be followed in order for the equipment to function in the manner intended.

SAFETY INSTRUCTIONS

1. Do not operate before reading the enclosed operating manual.
2. Use adequate protection, warning and safety equipment necessary to protect against hazards involved in installation and operation of this equipment.

NOTICE

- *The safety instruction tags shown below were attached to your unit prior to shipment. Do not remove, paint over or obscure in any manner.*
- *Failure to heed these warnings could result in serious bodily injury to the personnel operating and maintaining this equipment.*

⚠ WARNING

Keep body and clothing away from machine openings.

⚠ WARNING

Hearing protection required.

⚠ CAUTION

Do not operate without guards in place.

⚠ CAUTION

Do not touch hot surfaces.

⚠ WARNING

- **Keep hands and clothing away from rotating machinery, inlet and discharge openings.**
- **Blower and drive mounting bolts must be secured.**
- **Drive belts and coupling guards must be in place.**
- **Noise level may require ear protection.**
- **Blower heat can cause burns if touched.**

Safety Precautions

For equipment covered specifically or indirectly in this operating manual, it is important that all personnel observe safety precautions to minimize the chances of injury. Among many considerations, the following should particularly be noted:

- Blower casing and associated piping or accessories may become hot enough to cause major skin burns on contact.
- Internal and external rotating parts of the blower and driving equipment can produce serious physical injuries. Do not reach into any opening in the blower while it is operating or while subject to accidental starting. Cover external moving parts with adequate guards.
- Disconnect power before doing any work, and avoid bypassing or rendering inoperative any safety or protective devices.
- If blower is operated with its piping disconnected, place a strong, coarse screen over the inlet and avoid standing in discharge air stream.
- Avoid extended exposure in close proximity to machinery with high intensity noise levels.
- Use proper care and good procedures in handling, lifting, installing, operating, and maintaining the equipment.
- Other potential hazards to safety may be associated with operation of this equipment. All personnel working in or passing through the area should be warned by signs and trained to exercise adequate general safety precautions.
- Hearing protection may be required depending on silencing capabilities.

⚠ CAUTION

Customers are cautioned to provide adequate protection, warning and safety equipment necessary to protect personnel against hazards involved in the installation and operation of this equipment in the system or facility.

⚠ WARNING

Do not use air blowers on explosive or hazardous gases. Each size blower has limits on pressure differential, running speed, and discharge temperature, which must not be exceeded. Consult *Specifications Table 3-1 on page 6*.

PROTECTIVE MATERIALS

- Remove protective materials from the shaft.
- Remove the protective covers from the inlet and outlet ports, and inspect the interior for dirt and foreign material.

⚠ WARNING

Keep hands, feet, foreign objects, and loose clothing from inlet and outlet openings to avoid injury or damage if lobes are to be rotated at this point.

The blower housing and associated piping or accessories may become hot enough to cause major skin burns on contact. Internal and external rotating parts of the blower and driving equipment can produce serious physical injuries. Never run the blower with the inlet or discharge piping removed. If it becomes necessary to inspect the rotating parts of the blower or to change V-belts, be absolutely sure that all power to the motor controls has been shut off and that the motor controls are locked out and have been properly tagged before proceeding.

⚠ WARNING

Avoid extended exposure in close proximity to machinery with high intensity noise levels. Always wear adequate ear protection. Use proper care and good procedures in handling, lifting, installing, operating, and maintaining the equipment.

⚠ CAUTION

Use proper care and good procedures in handling, lifting, installing, operating and maintaining the equipment.

03 INSTALLATION

Operating Characteristics

Qx blowers are rotary positive displacement type units with tri-lobe rotors rotating in opposite directions within a housing closed at the ends by end plates. The pumping capacity is determined by size, operating speed, and differential pressure conditions.

The inlet to the discharge is sealed with operating clearances that are very small. Internal lubrication is not needed, as there is no moving contact.

Clearances between the rotors during rotation are maintained by a pair of accurately machined helical timing gears, mounted on the two shafts extended outside the air chamber. The two intermeshing rotary lobes are designed to rotate and trap air or gas between each rotor and the housing. As the rotor lobes rotate past the edge of the suction port, the trapped air or gas is essentially at suction pressure and temperature. Since the blower is a constant volume device, the trapped air remains at suction pressure until the leading rotor lobe opens into the discharge port. The close clearances between the rotors inhibit back slippage of the trapped volume from between the rotors, and the trapped volume is forced into the discharge piping. Compression occurs not internal to the blower but by the amount of restriction, either downstream of the blower discharge port or upstream of the blower inlet port.

Air moves not between the rotors but between the rotors and the side of the housing. Also, the machine is bi-directional, meaning that the direction of rotation of the blower can make either side the inlet or discharge. See also ***Figure 3-1 on page 6***, Flow Direction by Rotation.

Protect the blowers with cut-in switches or bypass valving to limit differential pressure across the blower. ***See Operating Limitations on page 5*** for more information. When a belt drive is used, it is possible to adjust blower speed to obtain the desired capacity by changing the diameter of one or both sheaves, or by using a variable-speed motor pulley.

Operating Limitations

To permit continued satisfactory performance, a blower must be operated within certain conditions. The manufacturer's warranty is contingent on such operation. Maximum limits for temperature and speed are specified in ***Table 3-1 on page 6*** for various blower sizes when operated under the standard atmospheric conditions. Do not exceed these limits.

EXAMPLE: Seldom does the operation of a blower result in pressure differentials large enough to strain the blower drive train (bearings, gears, and seals). Typically, the maximum allowable temperature limit (the limit is a function of the temperature rise as well as the inlet temperature) for any particular blower may occur well before the maximum speed or allowable power rating is reached. Temperature rise then becomes the limiting condition. The operating limit is to be determined by the maximum rating reached first, and it can be any one of the following: temperature, speed, or horsepower.

NOTE: Specially ordered blowers with non-standard construction, or with rotor end clearances greater than shown in this manual, will not have the operating limits specified in *Specifications Table 3-1 on page 6*. Contact your M-D Pneumatics sales representative for specific information.

Specifications Table

MODEL	SERIES	PORT SIZE	APPROXIMATE OIL CAPACITY		MAXIMUM ALLOWABLE DISCHARGE TEMPERATURE	MAXIMUM TEMPERATURE RISE	MAXIMUM PRESSURE	MAXIMUM VACUUM	MAXIMUM RPM
			VERTICAL FLOW	HORIZONTAL FLOW					
3203 3208	AA	2 in. (51 mm) 3 in. (76 mm) 4 in. (102 mm) 4 in. (102 mm)	0.68 qt (0.64 L)	0.38 qt (0.36 L)	445°F (229°C)	325°F (163°C)	18 psig	17 inch-Hg (576 mbar)	4,800
4606 4610	AA	4 in. (102 mm) 6 in. (152 mm) 6 in. (152 mm)	1.82 qt (1.1 L)	1.07 qt (1 L)	445°F (229°C)	325°F (163°C)	18 psig	17 inch-Hg/ (576 mbar)	4,000
6009 6015	AA	8 in. (203 mm) 8 in. (203 mm) 10 in. (254 mm)	4.68 qt (4.4 L)	2.63 qt (2.5 L)	445°F (229°C)	325°F (163°C)	18 psig	17 inch-Hg (576 mbar)	3,200

Table 3-1 – Specifications

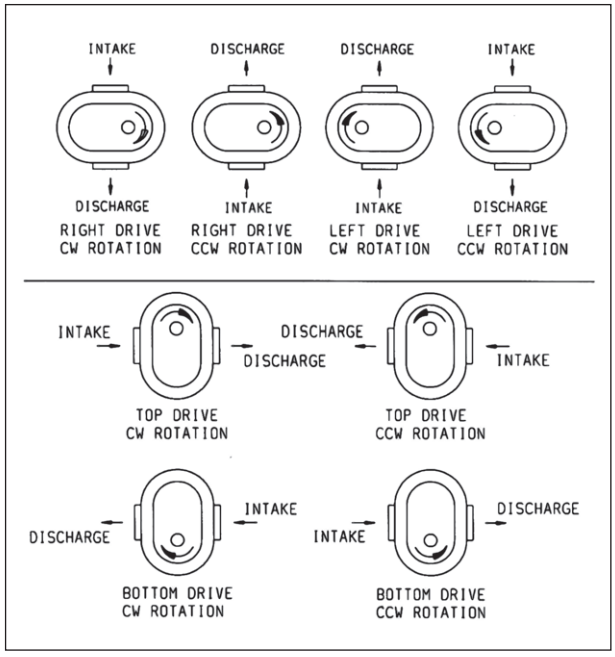


Figure 3-1 – Flow Direction by Rotation

START-UP CHECKLIST

It is recommended that these start-up procedures be followed in sequence and checked off (☑) in the boxes provided in any of the following cases.

• During initial installation • After any shutdown period	• After maintenance work has been performed • After blower has been moved to a new location

DATES CHECKED:	☐ ☐ ☐
☐☐☐☐	Check the unit for proper lubrication. Proper oil level is critical. ***See Lubrication (Splash) on page 11***. ***See Recommended Lubricants on page 26*** for information on acceptable lubricants for the product.
☐☐☐☐	Check the V-belt drive for proper belt alignment and tension. ***See V-Belts on page 9***.
☐☐☐☐	Carefully turn the rotors by hand to be certain they do not bind.

⚠ WARNING

Disconnect power. Make certain power is off and locked out before touching any rotating element of the blower, motor, or drive components.

⚠ WARNING

When touching the blower or motor during operation, make certain that loose clothing, long hair, neckties, loose shoelaces, rags, etc. are secured snugly and cannot accidentally dangle into rotating elements such as shafts, belts, and sheaves.

☐☐☐☐	"Bump"* the unit with the motor to check rotation (counterclockwise when facing the shaft) and to be certain it turns freely and smoothly.
☐☐☐☐	Start the unit and operate it for 30 minutes at no load. During this time, feel the cylinder for hot spots. If minor hot spots occur, ***see Troubleshooting on page 17.***
☐☐☐☐	Apply the load and observe the operation of the unit for 1 hour.
☐☐☐☐	If minor malfunctions occur, discontinue operation and ***see Troubleshooting on page 17***.

* Start intermittently and then turn off immediately.

FOUNDATION

The blower does not need a special foundation. However, it does require a solid, level floor and adequate frame support.

LOCATION

Install the blower in a protected indoor location, if possible. An unprotected outdoor installation is satisfactory only when correct lubrication for the expected temperatures is provided. ***See Recommended Lubricants on page 26***. Just before starting the installation, remove plugs or covers from inlet and discharge connections. Inspect for dirt or foreign objects inside machine, and then turn the drive shaft by hand to make sure it rotates freely. Mount in a level position. Use a baseplate that is rigid, solidly supported, and structurally sound. Make sure the feet rest evenly on the plate before fastening down. Twisting or cramping the blower during mounting will cause rotor contact and binding during operation.

SOFT FOOT

Soft foot is a condition in which one of the blower feet does not sit flat on the base. Usually, this is due to irregularities in the surface to which the blower is mounted. When you tighten the bolt on the foot, the blower will distort slightly, but enough to cause problems with bearing and seal life, and premature internal contact between the rotors and the housing.

1. Place blower on base.
2. Check each foot for gaps between foot and base (soft foot), shim as necessary to fill gap within .002 in. (.05 mm). Below are shown the two most common types of soft foot conditions. If either type is present, and measures more than .003 in. (.076 mm), the blower may fail prematurely.
3. Tighten all bolts.
4. Mount a dial indicator on base contacting one foot at 12 o'clock position.
5. Loosen bolt on that foot. Observe indicator travel and add shims as needed to reduce "spring" to less than .002 in. (.05 mm). Repeat steps 4 and 5 on remaining feet.

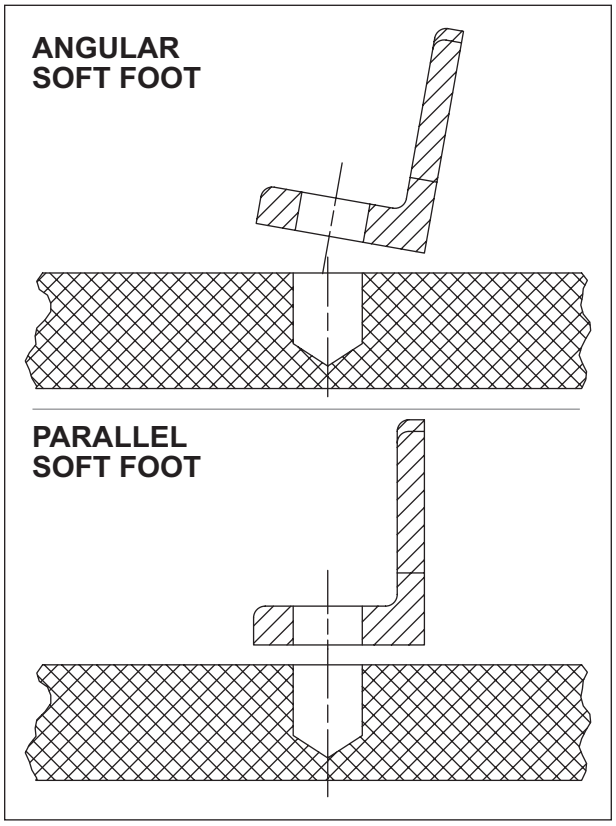


Figure 3-2 – Illustrations of Soft Foot

Transmission of small operating vibrations to a support structure may be objectionable in some applications. Use of vibration isolators or vibration-absorbing materials can be effective in overcoming this transmission. To avoid causing distortion, apply the treatment under the common motor/blower base or mounting plate rather than directly under the feet alone. Make sure piping is accurately squared with the blower and supported independently. Use only clean, new pipe, and make certain it is free of scale, cuttings, weld beads, dirt, or any other foreign material.

To guard against damage to the blower, make sure that an inlet filter is used. Clean the filter of collected debris after 3 hours of operation and periodically thereafter.

MOUNTING STRESS

Stress imparted from incorrectly aligned piping or mounting will create problems with bearing and seal life, possibly leading to premature internal contact. The blower should sit stress-free and evenly on its supporting surface. Take care to evenly tighten the mounting bolts to avoid imparting undue stress into the blower. Stress can be checked in a free state with feeler stock or verified on a previously installed blower with the aid of a dial indicator. Spring or gap should be less than 0.002 in. (0.05 mm).

BLOWER AIR INTAKE

To minimize maintenance, supply the blower with the cleanest air possible. The air must not contain any flammable or toxic gases, as the blower will concentrate these gases. This could result in damage to the blower and surrounding property and lead to personal injury or death.

⚠ WARNING

Do not use air blowers on explosive or hazardous gases. Each size blower has limits on pressure differential, running speed, and discharge temperature. These limits must not be exceeded.

If it is necessary to take air from a remote source, such as in a vacuum application, make sure the diameter of the piping is at least the equal to the diameter of the blower inlet. For distances greater than 20 ft (6 m), enlarge the pipe diameter to reduce inlet restriction. Excessive restriction will reduce the efficiency of the blower and elevate its discharge temperature.

The piping used should also be corrosion-resistant and free of scale and dirt. Keep the inlet covered to keep out foreign objects and rain.

MOTOR DRIVES

Two drive connections commonly used are direct drive and V-belt drive.

DIRECT COUPLED

When installing the motor directly to the blower, align the shafts to the coupling according to the coupling manufacturer's instructions.

Blowers shipped with motor directly coupled and mounted on a common base have been aligned prior to shipment. Further alignment is not normally necessary, but be sure to check the alignment and make adjustments if necessary prior to starting the blower.

V-BELTS

If the motor and blower are V-belt connected, the sheaves on both the motor and blower shafts should be as close to the shaft bearings as possible. Blower sheave is not more than 1/4 in. (6.5 mm) from the blower drive end cover. The drive sheave is as close to the driver bearing as possible. Take care when installing sheaves on the blower and motor shafts. Make sure the face is accurately in line to minimize belt wear.

Adjust the belt tension to the manufacturer's specifications using a belt tension tester. Check new belts for proper tension after 24 hours of run time. When manufacturer data is not available, industry guidelines recommend 1/64 in. deflection for each inch of span (0.157 mm deflection per centimeter of span) at 8 to 10 lb (3.6 – 4.5 kg) of force in the center of the belt. ***See Figure 3-3***.

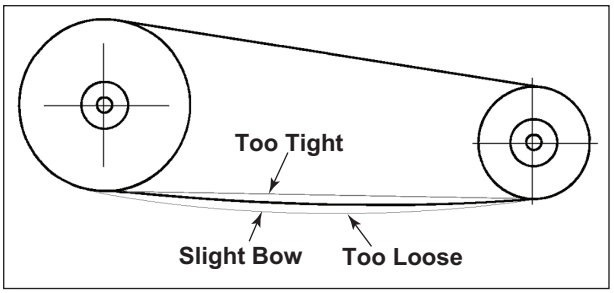


Figure 3-3 – General appearance of V-belt drive

Insufficient tensioning is often indicated by slipping (squealing) at start-up. Do not use belt dressing on V-belts. Keep sheaves and V-belts free of oil and grease. Removed tension from belts if the drive is to be inactive for an extended period of time. For more specific information, consult the drive manufacturer. In a V-belt drive, the blower sheave must fit its shaft accurately, run true, and be mounted as close to the bearing housing as possible to minimize bearing loads. ***See Figure 3-4***.

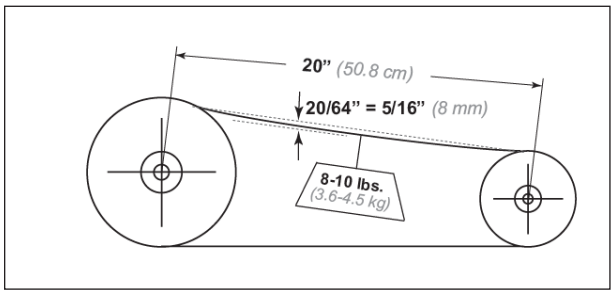


Figure 3-4 – Setting of proper tension for a V-belt drive

A tight or driving fit will force the drive shaft out of its normal position and cause internal damage. A loose fit will result in shaft damage or breaking. Make sure the motor sheave fits correctly and is properly aligned with the blower sheave.

Adjust the motor position on its sliding base so that belt tension is in accordance with the drive manufacturer's instructions. Always avoid excessive belt tension. Recheck tension after the first 10 hours of operation and periodically thereafter to avoid slippage and loss of blower speed.

Check the blower after installation and before applying power by rotating the drive shaft by hand. If the drive shaft does not rotate freely:

- Look for uneven mounting, piping strain, excessive belt tension, or coupling misalignment.
- Check the blower to make sure oil was added to the reservoirs.

ELECTRICAL CONNECTIONS

Wire the motor and other electrical devices, such as solenoid valves and temperature switch, to the proper voltage and amperage as indicated on the nameplate of each component being wired. Turn the blower by hand after wiring is completed to determine that there are no obstructions, and that the blower turns freely. Then, momentarily start the blower to check the direction of rotation. The airflow direction can be reversed by reversing the appropriate motor leads.

RELIEF VALVES

M-D Pneumatics recommends the use of relief valves to protect against excessive pressure or vacuum conditions. Test these valves at initial start-up to be sure they are properly adjusted to relieve at or below the maximum pressure differential rating of the blower.

⚠ CAUTION

Upon completion of the installation, and before applying power, rotate the drive shaft by hand. It must move freely. If it does not, look for uneven mounting, piping strain, excessive belt tension, coupling misalignment or any other cause for binding. If blower is removed and still does not rotate freely, check inside the blower housing for foreign material.

PIPING

- Ensure that inlet and outlet connections on all blowers are large enough to handle maximum volume with minimum friction loss. Inlet and outlet connections on all blowers are large enough to handle maximum volume with minimum friction loss.
- Maintain same-diameter piping.
- Do not support silencers by the blower.
- Avoid stress loads and bending moments.

Be certain all piping is clean internally before connecting to the blower. Place a 16-mesh wire screen backed with hardware cloth at or near the inlet connections for the first 50 hours of use until the system is clean. Clean the screen after 3 hours of operation and completely discard it once the system is clean, as it will eventually deteriorate and small pieces going into the blower can cause serious damage. A horizontal or vertical airflow piping configuration is easily achieved by rearranging the mounting feet position.

⚠ WARNING

Do not operate equipment without adequate silencing devices since high noise level may cause hearing damage. (Reference OSHA Standards).

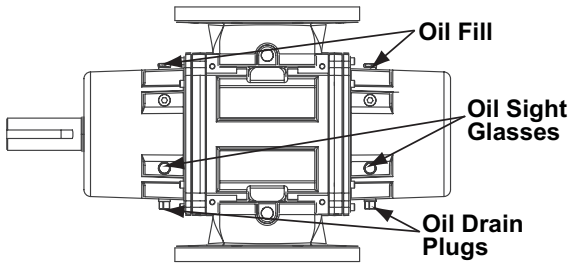
LUBRICATION (SPLASH)

Before starting the unit, fill oil reservoirs as instructed below:

1. Remove fill plugs or breathers from the gear (drive) end and free (non-drive) end plates.
2. Pour oil through the fill hole until oil appears in the sight glass. Slowly bring oil up to center of glass. Repeat for both end plates. Fill each oil sump independently.
3. Re-seal plugs and reinstall in end plates.
4. Check oil levels frequently. Shut down the blower to properly check oil levels.

PLEASE NOTE THE FOLLOWING:

- Every M-D Pneumatics blower has been factory-tested, oil-drained, and shipped dry.
- Fill oil reservoirs to the proper level before operation.



NOTE: This illustration shows oil fill, oil drain, and sight glass locations on both ends.

Figure 3-5 – Locations of Oil Fill, Oil Drain Plug, and Oil Sight Glass

- ***See Recommended Lubricants on page 26*** for lubricants approved for use in M-D Pneumatics blowers.
- Add oil in the quantity shown in ***Specifications Table 3-1 on page 6***.
- Time lapse between oil changes will vary depending on operating conditions.
- Higher blower operating temperatures are directly related to higher oil temperatures.

FREQUENTLY ASKED QUESTIONS REGARDING LUBRICATION

What are the perceived modes of failure when blowers are run beyond the specified duty cycles?

Several things are happening as the lubricant goes through the unit. First, it is absorbing frictional energy in the form of heat. This heat has to be dissipated through either surface contact with cooler materials or in a volume of lubricant. While reducing the friction, the lubricant is also going through a shearing process and the molecular structure is broken down.

The result is that the lubricant will begin to thicken because of the shorter molecular chains and the drop out of additive packages. The thickened lubricant will cause more drag, increasing the friction and heat and further degrading the lubricant.

Operation of the blower (environment, run time, speed, and pressure) has a direct effect on duty cycles. The published cycles are based on worst-case conditions.

What is the functional detriment if the "wrong oil" is used?

The lubricant is selected based on bearing speed, gear speed, and operating temperature. If the lubricant is too light, it increases wear by not separating the sliding surfaces and it will not remove the heat adequately. If the lubricant is too thick, the drag in the bearings is increased, causing them to run hotter. Thicker lubricant will not flow as readily into the gears and it will reduce the available backlash. Lubricants at our conditions are incompressible.

What is the functional detriment if the oil is not serviced?

If the lubricant is not serviced at the proper interval, the shearing action in the bearing and the gears will begin to take its toll and the lubricant will thicken. The blower will run hotter and the wear on moving parts will increase. The lubricant will generally appear dirtier, caused by material rubbing off the components. The lubricant will discolor because of overheating. An indicator of the breakdown of a lubricant is the increase in the Total Acid Number (TAN) and a change of 10 percent in the base viscosity.

04 OPERATION

Before starting the blower for the first time under power, recheck the installation thoroughly to reduce the likelihood of difficulties. Use the following checklist as a guide, but consider any other special conditions in your installation.

1. Be certain no bolts, rags, or dirt have been left in the blower.
2. Be certain that inlet piping is free of debris. If an open outdoor air intake is used, be sure the opening is clean and protected by an inlet filter. This also applies to indoor use.
3. If installation is not recent, check blower leveling, drive alignment, belt tension, and tightness of all mounting bolts.
4. Be certain the proper volume of oil is in the oil reservoir chambers.
5. Be certain the driving motor is properly lubricated and connected through suitable electrical overload devices.
6. With electrical power off and locked out to prevent accidental starting, rotate the blower shaft several times by hand to make sure the blower is rotating freely. Unevenness or tight spots are indicators of a condition that should be corrected before progressing.
7. Check motor rotation by momentarily pushing the START button and then checking the flow direction of the blower. Reverse the motor connections if the flow is in the wrong direction.

Carry out initial operation under “no load” conditions by opening all valves and venting the discharge to atmosphere, if possible. Then, start the motor briefly, listen for unusual noises, and make sure the blower coasts freely to a stop. If no problem appears, repeat this check, and let the motor run slightly longer. If any questions exist, investigate before proceeding.

Assuming all tests are satisfactory, the blower will now be ready for continuous full-load operation. During the first several days, check periodically to make sure all conditions remain acceptable and steady. These checks may be particularly important if the blower is part of a process system where conditions may vary. At the first opportunity, stop the blower and clean or remove the inlet filter. Also recheck leveling, coupling alignment or belt tension, and mounting bolts for tightness.

RECOMMENDED SHUTDOWN PROCEDURE TO MINIMIZE RISK OF FREEZING OR CORROSION

When a blower is taken out of service, it may require internal protection against rusting or corrosion. The need for such protection must be a matter of judgment based on existing conditions as well as length of down time. Under atmospheric conditions producing rapid corrosion, the blower should be protected immediately. When an air piping system has high humidity or moisture, water condensation can occur after the blower is shut down and it begins to cool. Condensation creates an environment favorable to corrosion of

the iron internal surfaces and to ice formation in cold weather. Both of these conditions can close the operating clearances, causing the blower to fail upon future start-up.

The following shutdown procedure minimizes the risk of moisture condensation, corrosion, and freezing.

NOTICE

Care must be taken to avoid overloading or overheating.

1. Isolate the blower from the moist system piping, allowing the blower to intake atmospheric air.
2. Operate the blower under a slight load, allowing the blower to heat within safe limits. The heat generated by the blower will quickly evaporate residual moisture.
3. For carpet cleaning applications, after the work is completed, simply allow the blower to run 3 – 5 minutes with the suction hose and wand attached. The suction hose and wand will provide enough load to the blower to evaporate the moisture quickly.
4. For extended shutdown, inject a small amount of a light lubricating oil such as 3-in-One®* or a spray lubricant such as WD-40®* into the inlet of the blower just before shutdown. The lubricant will provide an excellent protective coating on the internal surfaces. If using a spray lubricant, take care to prevent the applicator tube from getting sucked into the blower. The applicator tube will damage the blower, likely to a degree where repair would be required.

* 3-in-One and WD-40 are registered trademarks of WD-40 Company.

LONG TERM STORAGE

1. Spray the interior (lobes, housing, and end plates) with rust preventative.
2. Apply a rust preventative grease to the drive shaft.
3. Attach a desiccant bag to either of the covers to prevent condensation from occurring inside the blower. Make sure any desiccant bag (or bags) is attached to the covers so that they will be removed before start-up of the blower.
4. Store the blower in an air conditioned and heated building if possible. If air conditioned and heated storage is not possible, make conditions as dry as possible.
5. If possible, rotate the drive shaft by hand at least monthly in order to prevent seals from setting in one position.

05 MAINTENANCE

GENERAL

Regular inspection of the blower and its installation, along with complete checks on operating conditions, will pay dividends in added life and usefulness. Also, service the drive per the manufacturer's instructions and lubricate the coupling or check the belt drive tension. Use thermometers and gauges to make sure that blower operating temperature and pressure remain within allowed limits.

REGULAR MAINTENANCE

A well-designed maintenance program will add years of service to the blower.

Check a newly installed blower frequently during the first month of operation, especially lubrication. With the blower at rest, check the oil level in both the gear (drive) end and free (non-drive) end of the blower and add oil as needed. Complete oil changes are recommended every 1,000 – 1,200 operating hours, or more frequently depending on the type of oil and operating temperature. Also change the oil more frequently if pumping corrosive vapors or where excessive operating temperatures are encountered.

⚠ DANGER

The blower and parts may contain hazardous media. Assure that pump and parts are evacuated of hazardous media prior to servicing.

⚠ CAUTION

The electrical service must be isolated and de-energized prior to maintenance. Apply appropriate procedures to assure electrical supply is de-energized and cannot be inadvertently energized during maintenance.

Assure piping and product is isolated prior to maintenance of blower. Apply appropriate procedures to assure piping and product is isolated and that inadvertent opening of valves cannot occur during maintenance.

⚠ CAUTION

During routine maintenance, inspect and assure that guards are in place and secure.

When a blower is taken out of service, it may require internal protection against rusting or corrosion. The need for such protection must be a matter of judgment based on existing conditions as well as length of downtime. Under atmospheric conditions producing rapid corrosion, protect the blower immediately. ***See Long Term Storage on page 14***.

PREVENTATIVE MAINTENANCE

The following is recommended as a minimum maintenance program.

DAILY	WEEKLY	MONTHLY
1. Check and maintain oil level, and add oil as necessary. 2. Check for unusual noise or vibration (***See Troubleshooting on page 17***).	1. Clean all air filters. A clogged air filter can seriously affect the efficiency of the blower and cause overheating and increased oil usage. Replace if necessary. 2. Check the relief valve to make sure it is operating properly.	1. Inspect the entire system for leaks. 2. Inspect the condition of oil and change if necessary. 3. Check drive belt tension and tighten if necessary.

NOTICE

Oil levels should be checked every 24 hours of operation.

Proper oil drain schedules require oil be changed before the contaminant load becomes so great that the lubricating function of the oil is impaired or heavy disposition of suspended contaminants occurs. To check the condition of the oil, drain a sample into a clean container and check for the presence of water or solids. Slight discoloration of the oil should not necessitate an oil change.

TROUBLESHOOTING

Although M-D Pneumatics blowers are well designed and manufactured, problems may occur due to normal wear and the need for readjustment. The following chart lists symptoms that may occur along with probable causes and remedies.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Loss of oil	Gear housing not tightened properly	Tighten gear housing bolts.
	Lip seal failure	Disassemble and replace lip seal.
	Insufficient sealant	Remove gear housing and replace sealant. ***See Disassembly (3200 and 4600) on page 20***.
	Loose drain plug	Tighten drain plug.
Excessive bearing or gear wear	Improper lubrication	Correct oil level. Replace dirty oil. ***See Lubrication (Splash) on page 11***.
	Excessive belt tension	Check belt manufacturer's specifications for tension and adjust accordingly.
	Coupling misalignment	Check carefully, realign if necessary.
Lack of volume	Slipping belts	Check belt manufacturer's specifications for tension and adjust accordingly.
	Worn lobe clearances	Check for proper clearances. ***See Assembly Clearances on page 25***.
	Speed too low	Increase blower speed within limits.
	Obstruction in piping	Check system to ensure an open flow path.
Knocking	Blower out of time	Re-time.
	Distortion due to improper mounting or pipe strains	Check mounting alignment and relieve pipe strains.
	Excessive pressure differential	Reduce to manufacturer's recommended pressure. Examine relief valve and reset if necessary.
	Worn gears	Replace timing gears. ***See Disassembly (3200 and 4600) on page 20***.

SYMPTOM	PROBABLE CAUSE	REMEDIES
Excessive blower temperature	Too much or too little oil in gear reservoir	Check oil level. ***See Lubrication (Splash) on page 11***.
	Too low operating speed	Increase blower speed within limits.
	Clogged filter or silencer	Remove cause of obstruction.
	Excessive pressure differential	Reduce pressure differential across the blower.
	Elevated inlet temperature	Reduce inlet temperature.
	Worn lobe clearances	Check for proper clearances. ***See Assembly Clearances on page 25***.
Rotor end or tip drag	Insufficient assembled clearances	Correct clearances. ***See Assembly Clearances on page 25***.
	Case or frame distortion	Check mounting and pipe strain.
	Excessive operating pressure	Reduce pressure differential.
	Excessive operating temperature	Reduce pressure differential or reduce inlet temperature.
Vibration	Belt or coupling misalignment	Check carefully. Realign if necessary.
	Lobes rubbing	Check cylinder for hot spots, and then check for lobe contact at these points. Correct clearances. ***See Assembly Clearances on page 25***.
	Worn bearings or gears	Check condition of gears and bearings. Replace if necessary.
	Unbalanced or rubbing lobes	Possible buildup on casing or lobes, or inside lobes. Remove buildup and restore clearances.
	Driver or blower loose	Check mounting and tighten if necessary.
	Piping resonance	Check pipe supports, check resonance of nearby equipment, and check foundation.

REPAIR AND REPLACEMENT PARTS

Regular inspection of the blower and its installation, along with complete checks on operating conditions, will pay dividends in added life and usefulness. Pay special attention to lubrication of timing gears and bearings according to the information in ***Lubrication (Splash) on page 11***. Also, service the drive per the manufacturer's instructions and lubricate the coupling or check the belt drive tension. Use thermometers and gauges to make sure that blower operating temperature and pressure remain within allowed limits.

Should adjustments or replacement be needed, repairs can often be performed locally as described in this manual after obtaining the required parts. Personnel should have a good background of mechanical experience and be thoroughly familiar with the procedures outlined in this manual. For major repairs not covered in this manual, contact the nearest M-D Pneumatics service representative. When ordering parts, give all nameplate information, plus the item numbers and names as taken from the appropriate assembly drawing in this manual.

When ordering parts, supply the blower nameplate information, as well as the item number and parts description as per the parts lists and assembly drawings. Repair kits are available for all models. Consult the factory.

FACTORY SERVICE AND REPAIR

With proper care, M-D Pneumatics blowers will give years of reliable service. The parts are machined to close tolerances and require special tools by mechanics who are skilled at this work. Should major repairs become necessary, contact the factory for the location of the nearest service facility.

NOTICE

Current regulations require Material Safety Data Sheet to be completed and forwarded to M-D Pneumatics on any unit being returned for any reason which has been handling or involved with hazardous gases or materials. This is for the protection of the employees of M-D Pneumatics who are required to perform service on this equipment. Failure to do so will result in service delays.

NOTICE

When returning a blower to the factory for repair, under warranty, please note the factory will not accept any unit that arrives without authorization. Contact the Service Department for return authorization.

06

DISASSEMBLY AND REASSEMBLY INSTRUCTIONS

DISASSEMBLY (3200 AND 4600)

1. Remove all oil drain plugs and vent plugs from both ends of the blower. Before removing any parts, match-mark each component with a punch. This will allow the blower to be reassembled with the components in the same position. Match-mark the covers, end plate, housing, and both rotors.
2. Remove the drive key from the drive shaft. Remove the gear end cover. Remove the drive end cover. This is best accomplished by using two small pry bars at the dowel pins. Tap on the cover with a mallet while putting pressure on the cover with the pry bar. The cover will slowly move off the dowel pins. Inspect the drive shaft for grooves and burrs. Remove the drive shaft seal from the drive end cover.
3. Carefully remove the drive seal wear ring from the drive shaft. The simplest method to do so is to use a cut-off wheel and a die grinder. The hardened ring will typically snap open once it is cut most of the way through.
4. Remove the washer from the rotor shafts on the gear end. Remove the oil slinger assemblies.
5. Rotate the blower. Remove bolts and washers from rotor shafts on the gear end. Remove the timing gear bolts completely from the driven rotor. Remove the timing gear from the rotor shaft by using a gear puller. ***See Figure 6-1***. Rotate the gear as it is being removed to prevent binding. Inspect the gear teeth for wear and pitting. Inspect the rotor shaft keyway for wear and damage.
6. Remove the bolts from the free end of the end plate.

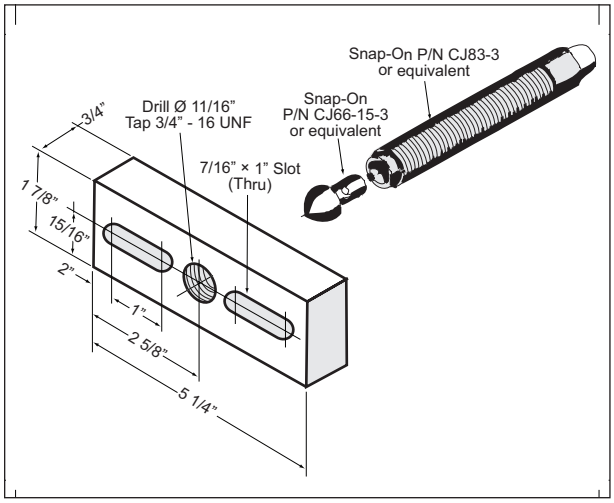


Figure 6-1 – Bar Puller

7. Use one of the following methods to remove the seal assembly from the drive end of the end plate:

   - Use 4 jacking screws on the end plate to apply even pressure to the jack screws to push the end plate from the housing. Remove the screws. Remove the retainer plate. Push the rotors out of the gear end end plate. Remove the bearings and bearing shield. Save the shims and measure for proper clearance for rebuilding the blower. Remove the seal assembly from the end plate.
   - Using a large arbor press, orient the blower drive shaft down, supported by the ports and use a straight bar (such as a puller bar shown in ***Figure 6-1***) to put even pressure on the gear end of the rotors. Once the rotors are pressed to flush with the bearings, insert metric bolts into the rotor or use a spacer slightly smaller than the shaft diameter to press the rotors through the bearings. Save shims and measure for proper clearance for rebuilding the blower. Remove the seal assembly from the end plate.
   - Reverse the machine to drive the shaft up and press each rotor free from the drive end end plate.

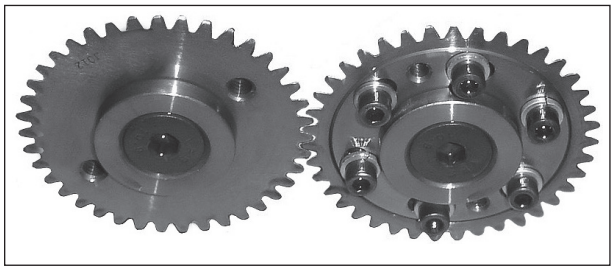


Figure 6-2 – Gear Alignment

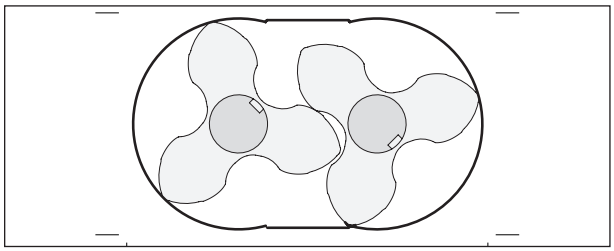


Figure 6-3 – Lobe Keyway Position

8. Remove the seals from the rotors with a plastic mallet or by tapping toward the end of the rotor shaft.

9. Remove the bearings, bearing shield, and seal assembly out of the free end end plates.

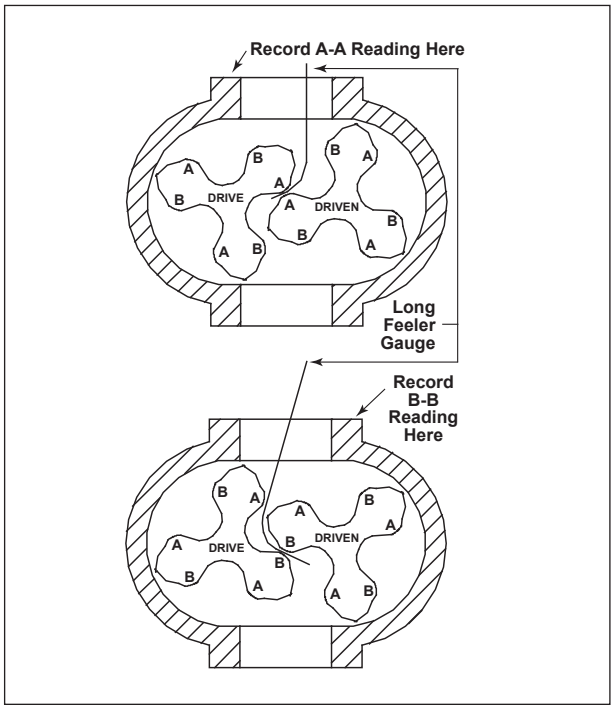


Figure 6-4 – Checking Rotor Interlobe Clearance

10. Use a hammer and brass bar to drive bearing and seal housing from end plates. Inspect bearing wear pattern and seal for wear and heat marks. Clean all parts before inspecting. Check the rotors' bearing and seal fits for bearing spinning along with the seal housing on the rotor shaft. Check the bearing bores and seal bores in the end plate for spinning of bearings and seal housing.

DISASSEMBLY (6000 SERIES)

1. Remove all oil drain plugs and vent plugs from both ends of the blower. Before removing any parts, match-mark each component with a punch. This will allow the blower to be reassembled with the components in the same position. Match-mark the covers, endplate, housing, and both rotors.

2. Remove drive key from drive shaft. Remove gear end cover. Remove drive end cover. This is best accomplished by using two small pry bars at the dowel pins. Tap on cover with a mallet while putting pressure on the cover with the pry bar. The cover will slowly move off the dowel pins. Inspect the drive shaft for grooves and burrs. Remove drive shaft seal from drive end cover.

3. Carefully remove the drive seal wear ring from the drive shaft. The simplest method to do so is to use a cut-off wheel and a die grinder. The hardened ring will typically snap open once it is cut most of the way through.

4. Remove washer from the rotor shaft on the drive end. Remove oil slinger assemblies. Remove bolts from drive end endplate.

5. Use 4 jacking screws on drive end endplate. Apply even pressure to jack screws to push the endplate from housing and rotor shafts. Remove shims from endplate. Remove bearings and seal assembly from endplate. Rotate unit. Remove bolts and washers from rotor shafts on the gear end. Remove the timing gear bolts completely from the driven rotor. Remove the timing gear from the rotor shaft by using a gear puller. ***See Figure 6-1***. Rotate the gear as it is being removed to prevent binding. Inspect gear teeth for wear and pitting. Remove rotor key from keyways. Inspect rotor shaft keyway for wear and damage.

6. Remove bolts from gear end endplate.

7. Use 4 jacking screws on the gear end endplate. Apply even pressure to the jack screws to push the end plate from the housing. Remove screws. Remove retainer plate. Push rotors out of gear end endplate. Remove bearings and remove bearing shield. Save shims and measure for proper clearance for rebuilding the unit. Remove seal assembly from the endplate. OR Using a large arbor press, orient the blower drive shaft down, supported by the ports and use a straight bar (such as a puller bar shown in ***Figure 6-1***) to put even pressure on the gear end of the rotors. Once the rotors are pressed to flush with the bearings, insert metric bolts in to the rotor or use a spacer slightly smaller than the shaft diameter to press the rotors through the bearings. Save shims and measure for proper clearance for rebuilding the unit. Remove seal assembly from endplate.

8. Remove seals from the rotors with a plastic mallet or by tapping towards the end of the rotor shaft.

9. Use a hammer and brass bar to drive bearing and seal housing from endplates. Inspect bearing wear pattern and seal for wear and heat marks. Clean all parts before inspecting. Check the rotors' bearing and seal fits for bearing spinning along with seal housing on the rotor shaft. Check bearing bores and seal bores in the endplate for spinning of bearings and seal housing.

ASSEMBLY (3200 AND 4600)

A maintenance kit containing all the components that are replaced during a normal blower overhaul is available from M-D Pneumatics. Be sure to have these parts, at a minimum, on hand prior to assembly. Be certain to have your serial number available when you contact the factory.

Check all parts to make sure they are clean and free of burrs or nicks that may have occurred when the blower was being disassembled. Check the repair kit for the correct parts needed to complete the assembly of the blower. Make sure you have the proper tooling and training required to assemble the blower. Take the proper time to read the manual before you begin.

Gear End Assembly (3200 and 4600)

1. *Seat the rotors on a fixture with the gear end of the rotors upward and in the "T" position. Make sure the drive rotor is in the correct location for the proper flow and rotation required for the application.*
2. Install the end plate and housing assembly onto the rotors. Using a seal pressing tool, press the seal assembly onto the rotor shafts and into the bores of the end plates. Add shims as needed. Install the seal slinger. Add shims as needed. Press the oil shield onto the rotor shafts. The oil shield is part of the seal assembly, but it must be pressed on after the seal assembly is installed.
3. Install the bearings press until seated. Install the retainer and bolts. Install the keys into the shaft. Install the gear assembly. Install the solid gear onto the long-tail drive rotor and two-piece gear onto the driven rotor. Install the locks. Install the screws.

Drive End (Free End) Assembly (3200 and 4600)

1. Turn the blower over. Set on the face of the gears and with feeler gauges check the gear end for proper clearances.
2. ***See Figure 6-5*** regarding bearing bore stack up and seal measurement.
3. Put depth micrometer on the housing and measure the distance to the rotor face or use flat block and feeler gauge. Add shims to get proper free end clearances. Install O-ring into groove.
4. Install end plate onto dowels. Bolt down with screws. With feeler gauge, check free end clearance. Adjust with shims appropriately.
5. Install seal assembly onto rotor shafts and into end plates. Press the slinger onto the shaft. Press the oil shield onto the shaft. Install the bearings. Install the slingers. Tighten the set screws into the shaft. Install the washer and install flat-head cap screw into the end of the shaft.

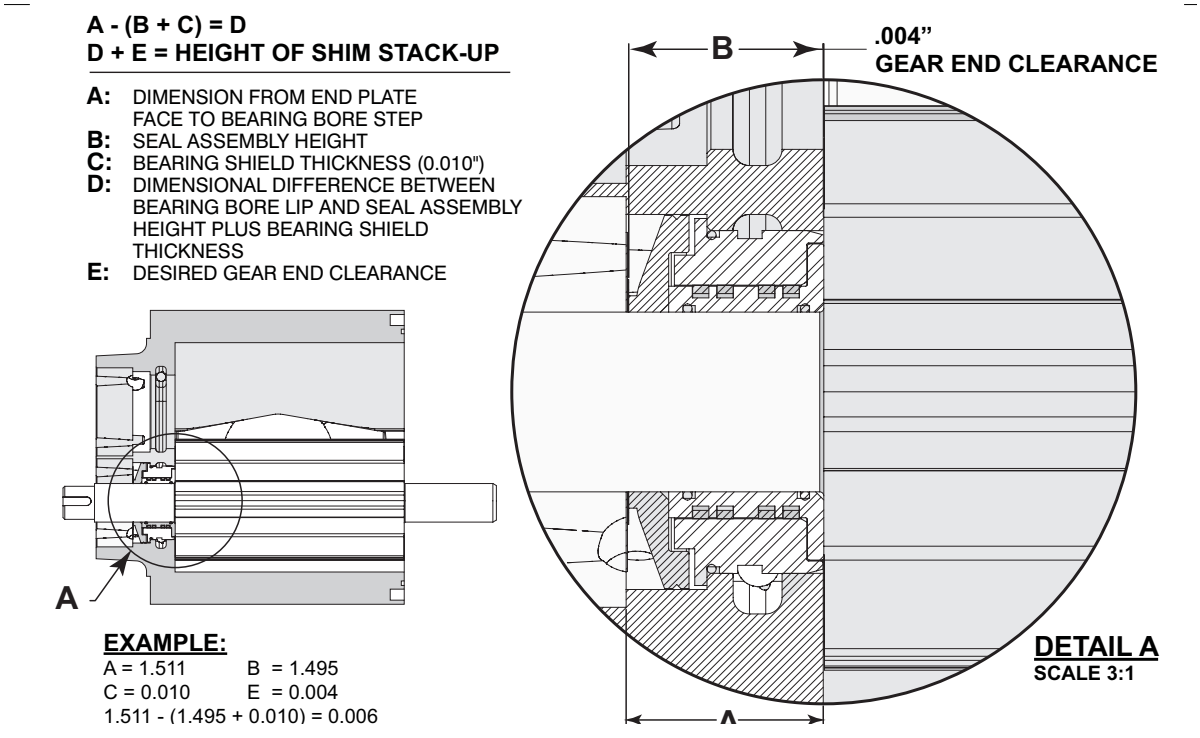


Figure 6-5 – Bearing Bore Stack-Up and Seal Measurement

ASSEMBLY (6000 SERIES)

A maintenance kit is available from M-D Pneumatics. This kit contains all the components that are replaced during a normal blower overhaul. As a minimum, these parts should be on hand prior to assembly. Be certain to have your serial number available when you contact the factory.

Check all parts to insure they are clean and free of burrs or nicks that may have occurred when the blower was being disassembled. Check the repair kit for the correct parts needed to complete the assembly of the unit. Make sure you have the proper tooling and training required to assemble the blower. Take the proper time to read the instruction manual before you begin.

Gear End Assembly (6000 Series)

1. Seat rotors on a fixture with the gear end of the rotors upward and with the rotor keyways pointing toward the 9 o'clock position. Make sure that the drive rotor is in the correct location for the proper flow and rotation required for the application.
2. ***See Figure 6-5*** regarding bearing bore stack-up and seal measurement.
3. Using a seal pressing tool, press the piston carrier onto the rotor shaft, and sleeves into the bores of endplates. Seat endplate over rotors. Install seal slingers and add shims as needed.
4. Install bearings and press until seated. Install retainer and bolts. Install gear spacer onto long-tail rotor.
5. Install keys into shaft. Install solid gear onto long-tail rotor and two-piece gear hub onto driven rotor. Install two-piece gear over hub. Install lock washers and screws into gear. Install rotor washers and screws over gears.
6. Check clearances. Add O-ring to housing. Add entire assembly to housing and bolt together.

Drive End (Free End) Assembly (6000 Series)

1. Turn unit over and set on face of gear and with feeler gauges check the free end for proper clearances. Add shims to get proper free end clearances. Install O-ring into groove.
2. Install piston carriers onto rotor shafts and sleeves into endplate bores.
3. Install endplate over rotor shafts and bolt to the housing.
4. With a feeler gauge, check free end clearance. Adjust with shims appropriately.
5. Install slingers onto each shaft and add .060 in. shims to each shaft. Install bearings.
6. Add bearing spacers. Install washers and bolts to hold bearing spacers. Add the inner race retainer to the drive rotor and tighten set screws.
7. Add spacers and oil slinger to the driven rotor and lock down using rotor washers.
8. Add wear ring to the drive rotor using wear ring tool.
9. Check all clearances and set timing. ***See Figure 6-4 on page 21*** to set Interlobe clearances.

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ASSEMBLY CLEARANCES

MODEL	GEAR END	DRIVE END	TOTAL CLEARANCE	INTERLOBE	TIP TO DOWEL	TIP TO PORT
3203	0.003 – 0.006 in. 0.08 – 0.15 mm	0.005 – 0.007 in. 0.13 – 0.18 mm	0.008 – 0.013 in. 0.20 – 0.33 mm	0.004 – 0.008 in. 0.10 – 0.20 mm	0.002 – 0.005 in. 0.05 – 0.13 mm	0.005 – 0.007 in. 0.13 – 0.18 mm
3208	0.003 – 0.006 in. 0.08 – 0.15 mm	0.011 – 0.014 in. 0.28 – 0.36 mm	0.014 – 0.020 in. 0.36 – 0.51 mm	0.004 – 0.008 in. 0.10 – 0.20 mm	0.002 – 0.005 in. 0.05 – 0.13 mm	0.005 – 0.007 in. 0.13 – 0.18 mm
4606	0.003 – 0.006 in. 0.08 – 0.15 mm	0.009 – 0.012 in. 0.23 – 0.30 mm	0.012 – 0.019 in. 0.30 – 0.48 mm	0.005 – 0.011 in. 0.13 – 0.28 mm	0.002 – 0.005 in. 0.05 – 0.13 mm	0.006 – 0.008 in. 0.15 – 0.20 mm
4610	0.003 – 0.006 in. 0.08 – 0.15 mm	0.014 – 0.017 in. 0.36 – 0.43 mm	0.017 – 0.024 in. 0.43 – 0.61 mm	0.005 – 0.011 in. 0.13 – 0.28 mm	0.002 – 0.005 in. 0.05 – 0.13 mm	0.006 – 0.008 in. 0.15 – 0.20 mm
6009	0.002 – 0.005 in. 0.05 – 0.013 mm	0.018 – 0.022 in. 0.46 – 0.56 mm	0.022 – 0.025 in. 0.56 – 0.64 mm	0.015 – 0.016 in. 0.38 – 0.41 mm	0.004 – 0.007 in 0.10 – 0.18 mm	0.007 – 0.009 in. 0.18 – 0.23 mm
6015	0.006 – 0.009 in. 0.05 – 0.013 mm	0.020 – 0.024 in. 0.51 – 0.61 mm	0.026 – 0.033 in. 0.61 – 0.69 mm	0.012 – 0.015 in. 0.38 – 0.41 mm	0.004 – 0.007 in. 0.10 – 0.18 mm	0.009 – 0.011 in. 0.18 – 0.23 mm

08

RECOMMENDED LUBRICANTS

RECOMMENDED LUBRICANTS FOR BLOWERS AND VACUUM BOOSTERS

Positive displacement blowers and vacuum boosters require proper lubrication for bearings, seals and gears to operate effectively and efficiently. Oil is distributed from the oil reservoir to the critical components by means of oil slingers that are attached to the rotor shaft. In certain models of CP Series blowers, a high-performance grease rated for high temperatures is used on the drive-end bearings.

MD full synthetic lubricants are recommended for blowers and vacuum boosters. MD lubricants are specifically formulated using unique additives that provide maximum protection and extend the life of your product over mineral oils or semi-synthetic lubricants.

⚠ WARNING

Do not overfill the oil sumps. Overfilling can result in gear damage or oil leaks.

⚠ CAUTION

Units are shipped without oil in the sumps. Ensure adequate oil has been added before operating.

MD oils are suitable for a wide range of operating temperatures that are based on model, operating speed and discharge temperature of the product.

FOR OXYGEN-ENRICHED SERVICE

Blowers and vacuum boosters operated in oxygen enriched applications should only use non-flammable, PFPE full synthetic lubricants. Blowers and vacuum boosters used in hydrogen service should only MD full synthetic oil

NOTE: Oxygen-enriched service only applicable for PD Plus blowers and vacuum boosters.

⚠ CAUTION

M-D Pneumatics and Kinney does not accept responsibility for damage caused by use of lubricants that are not recommended by M-D Pneumatics and Kinney.

MD BLOWER & BOOSTER LUBRICANTS SPECIFICATIONS				
PRODUCTS	**MD ONE**	**MD PLUS**	**MD MAX**	**MD FG**
VISCOSITY INDEX	150	154	157	141
@40°C, CST	99.1	231.7	340.9	99.3
@100°C, CST	14.4	27.6	37.2	13.9
FLASH POINT °F (°C)	510 (266)	480 (249)	491 (255)	515 (268)
POUR POINT °F (°C)	- 44 (-43)	-49 (-45)	-54 (-48)	-60 (-51)

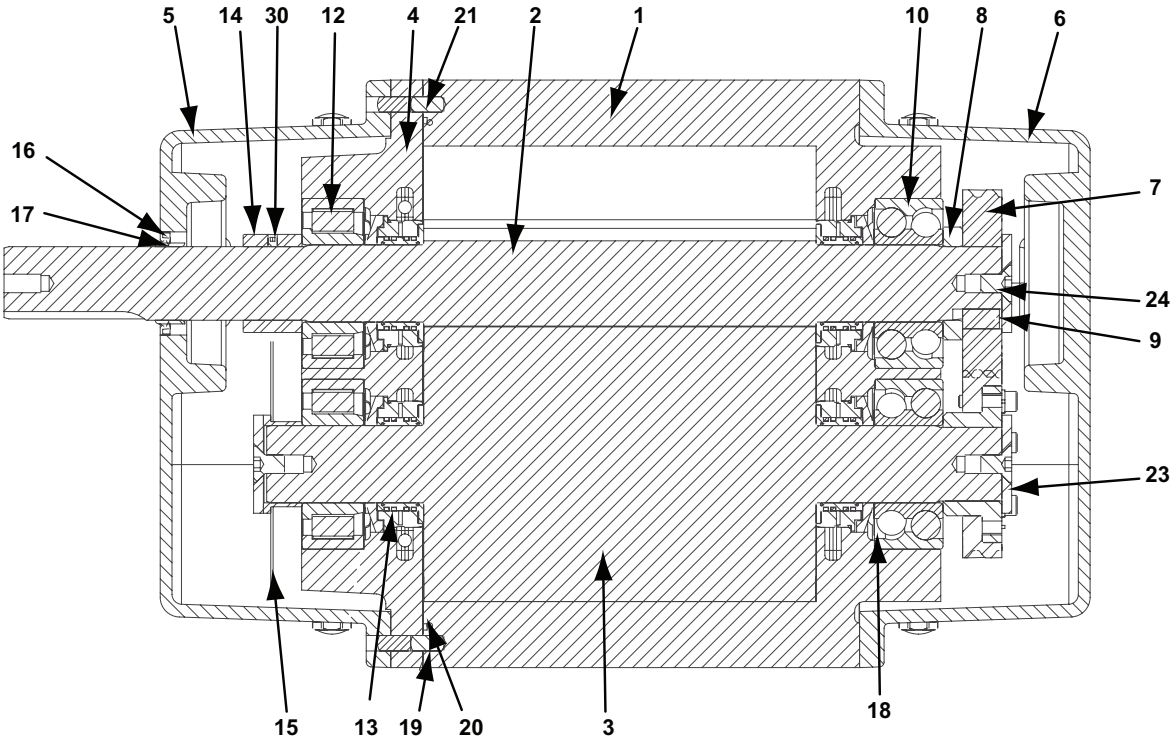
NOTE: MD One Vapor Pressure: (mm Hg) 100ºF <0.00004; 200ºF <0.00018

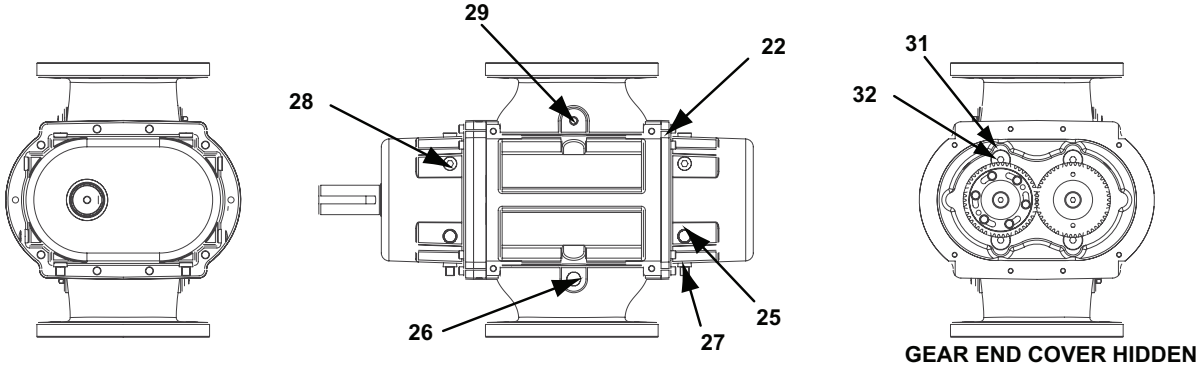
MD BLOWER & BOOSTER LUBRICANTS OPTIONS					
MD OIL TYPE	**1 QUART**	**1 GALLON**	**5 GALLON**	**55 GALLON BARREL**	**CASE 12 QUARTS**
MD ONE	16444-MD1-Q	16444-MD1-G	16444-MD1-5G	16444-MD1-B	16444-MD1-Q-C
MD PLUS	16444-MD2-Q	16444-MD2-G	16444-MD2-5G	16444-MD2-B	16444-MD2-Q-C
MD MAX	16444-MD3-Q	16444-MD3-G	16444-MD3-5G	16444-MD3-B	16444-MD3-Q-C
MD FG	16444-MD1-Q-FG	16444-MD1-G-FG	16444-MD1-5G-FG	16444-MD1-B-FG	16444-MD1-Q-C-FG

09

CUTAWAY DRAWINGS AND PARTS LISTS

CUTAWAY DRAWING FOR QX-3200 AND QX-4600 SERIES BLOWERS



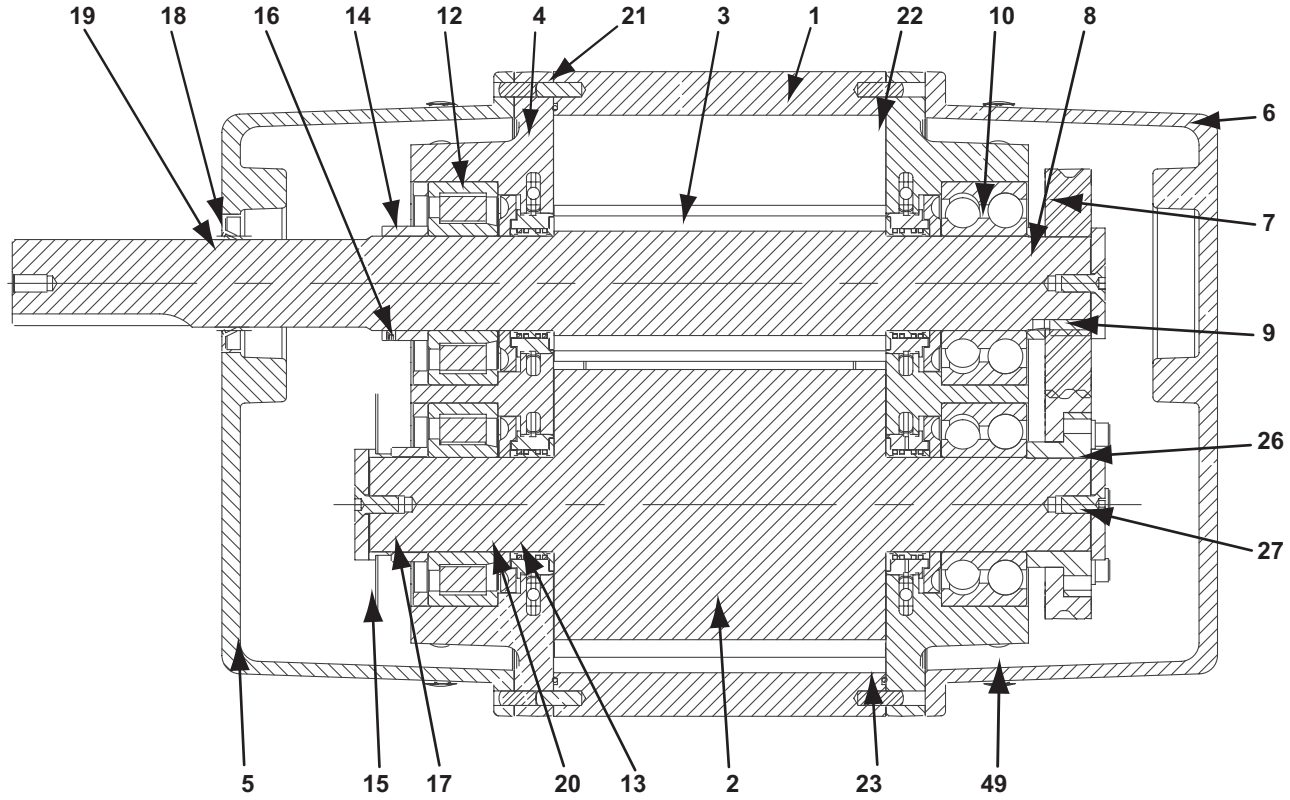


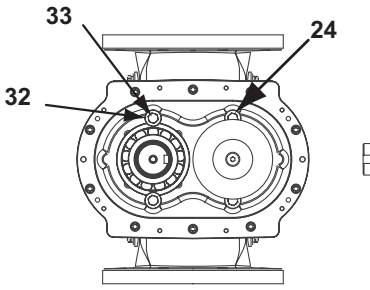
PARTS LIST FOR QX-3200 AND QX-4600 SERIES BLOWERS

ITEM NO.	PART DESCRIPTION	QTY
1	HOUSING	1
2	DRIVE ROTOR	1
3	DRIVEN ROTOR	1
4	ENDPLATE	1
5	DRIVE COVER	1
6	GEAR END COVER	1
7	GEAR ASSEMBLY	1
8	GEAR SPACER	1
9	GEAR KEY	2
10	BALL BEARING	2
12	CYLINDER BEARING	2
13	SEAL ASSEMBLY	4
14	DRIVE COLLAR	1
15	OIL SLINGER	1
16	LIP SEAL	1
17	SEAL WEAR RING	1

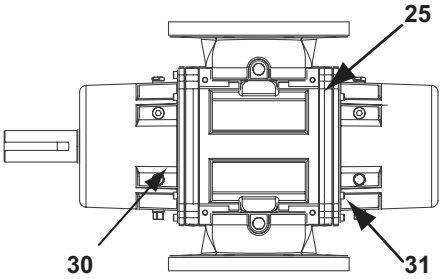
ITEM NO.	PART DESCRIPTION	QTY
18	BEARING SHIM	–
19	HOUSING SHIM	–
20	O-RING	1
21	DOWEL PIN	4
22	CAP SCREW	26
23	ROTOR WASHER	3
24	FLAT CAP SCREW	3
25	OIL SIGHT GLASS	4
26	HEX PIPE PLUG	2
27	OIL DRAIN PLUG	4
28	SOCKET PIPE PLUG	8
29	SQUARE PIPE PLUG	2
30	SET SCREW	2
31	WASHER	4
32	CAP SCREW	4

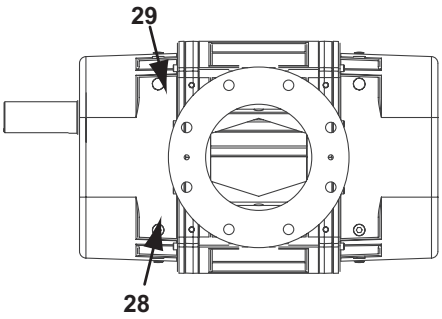
CUTAWAY DRAWING FOR QX-6000 SERIES BLOWERS





FREE END COVER HIDDEN





PARTS LIST FOR QX-6000 SERIES BLOWERS

ITEM NO.	PART DESCRIPTION	QTY
1	HOUSING	1
2	DRIVEN ROTOR	1
3	DRIVE ROTOR	1
4	ENDPLATE	2
5	DRIVE COVER	1
6	GEAR END COVER	1
7	GEAR ASSEMBLY	1
8	GEAR SPACER	1
9	TIMING GEAR KEY	2
10	BALL BEARING	2
12	CYLINDER BEARING	2
13	SEAL ASSEMBLY	4
14	DRIVE COLLAR	1
15	OIL SLINGER	1
16	SET SCREW	2
17	OIL SLINGER SPACER	1

ITEM NO.	PART DESCRIPTION	QTY
18	LIP SEAL	1
19	SEAL WEAR RING	1
20	BEARING SHIM	–
21	HOUSING SHIM	–
22	ORING	2
23	DOWEL PIN	6
24	CAP SCREW	16
25	CAP SCREW	20
26	ROTOR WASHER	3
27	FLAT CAP SCREW	3
28	SOCKET PIPE PLUG	8
29	HEX PIPE PLUG	6
30	OIL SIGHT GLASS	4
31	OIL DRAIN PLUG	2
32	WASHER	8
33	CAP SCREW	8

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WARRANTY – BLOWER PRODUCTS

Subject to the terms and conditions hereinafter set forth and set forth in General Terms of Sale, M-D Pneumatics (the Seller) warrants products and parts of its manufacture, when shipped, and its work (including installation and start-up) when performed, will be of good quality and will be free from defects in material and workmanship. This warranty applies only to Seller's equipment, under use and service in accordance with seller's written instructions, recommendations and ratings for installation, operating, maintenance and service of products, for a period as stated in the table below. Because of varying conditions of installation and operation, all guarantees of performance are subject to plus or minus 5% variation. (Non-standard materials are subject to a plus or minus 10% variation)

PRODUCT TYPE	TYPE OF APPLICATION	
	ATMOSPHERIC AIR OR PROCESS AIR WITHOUT LIQUIDS PRESENT	PROCESS GASES OTHER THAN AIR, OR ANY LIQUID INJECTED APPLICATION
New *(Qx™ models only)*	30 months from date of shipment, or 24 months after initial startup date, whichever occurs first.	Consult Factory
New *(all other models)*	24 months from date of shipment, or 18 months after initial startup date, whichever occurs first	18 months from date of shipment, or 12 months after initial startup date, whichever occurs first
Repair	12 months from date of shipment, or remaining warranty period, whichever is greater	12 months from date of shipment, or remaining warranty period, whichever is greater

THIS WARRANTY EXTENDS ONLY TO BUYER AND/OR ORIGINAL END USER, AND IN NO EVENT SHALL THE SELLER BE LIABLE FOR PROPERTY DAMAGE SUSTAINED BY A PERSON DESIGNATED BY THE LAW OF ANY JURISDICTION AS A THIRD PARTY BENEFICIARY OF THIS WARRANTY OR ANY OTHER WARRANTY HELD TO SURVIVE SELLER'S DISCLAIMER.

All accessories furnished by Seller but manufactured by others bear only that manufacturer's standard warranty.

All claims for defective products, parts, or work under this warranty must be made in writing immediately upon discovery and, in any event within one (1) year from date of shipment of the applicable item and all claims for defective work must be made in writing immediately upon discovery and in any event within one (1) year from date of completion thereof by Seller. Unless done with prior written consent of Seller, any repairs, alterations or disassembly of Seller's equipment shall void warranty. Installation and transportation costs are not included and defective items must be held for Seller's inspection and returned to Seller's Ex-works point upon request.

THERE ARE NO WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS OF PURPOSE.

After Buyer's submission of a claim as provided above and its approval, Seller shall at its option either repair or replace its product, part, or work at the original Ex-works point of shipment, or refund an equitable portion of the purchase price.

The products and parts sold hereunder are not warranted for operation with erosive or corrosive material or those which may lead to build up of material within the product supplied, nor those which are incompatible with the materials of construction. The Buyer shall have no claim whatsoever and no product or part shall be deemed to be defective by reason of failure to resist erosive or corrosive action nor for problems resulting from build-up of material within the unit nor for problems due to incompatibility with the materials of construction.

Any improper use, operation beyond capacity, substitution of parts not approved by Seller, or any alteration or repair by others in such manner as in Seller's judgment affects the product materially and adversely shall void this warranty.

No employee or representative of Seller other than an Officer of the Company is authorized to change this warranty in any way or grant any other warranty. Any such change by an Officer of the Company must be in writing.

The foregoing is Seller's only obligation and Buyer's only remedy for breach of warranty, and except for gross negligence, willful misconduct and remedies permitted under the General Terms of Sale in the sections on CONTRACT PERFORMANCE, INSPECTION AND ACCEPTANCE and the PATENTS Clause hereof, the foregoing is BUYER'S ONLY REMEDY HEREUNDER BY WAY OF BREACH OF CONTRACT, TORT OR OTHERWISE, WITHOUT REGARD TO WHETHER ANY DEFECT WAS DISCOVERED OR LATENT AT THE TIME OF DELIVERY OF THE PRODUCT OR WORK. In no event shall Buyer be entitled to incidental or consequential damages. Any action for breach of this agreement must commence within one (1) year after the cause of action has occurred.

May 2008

OPERATING DATA FORM / PRODUCT REGISTRATION

It is to the user's advantage to have the requested data filled in below and available in the event a problem should develop in the blower or the system. This information is also helpful when ordering spare parts.

Model No. _____ V-Belt Size _____ Length _____

Serial No. _____ Type of Lubrication _____

Startup Date _____ _____

Pump RPM _____ Operating Vacuum _____

Pump Sheave Diameter _____ Any other Special Accessories Supplied or in use:

Motor Sheave Diameter _____ _____

Motor RPM _____ HP _____ _____

NOTES: _____

_____

_____

_____

IMPORTANT

All blowers manufactured by M-D Pneumatics are date coded at time of shipment. In order to assure you of the full benefits of the product warranty, please complete, tear out and return the product registration card. You may also register your product online at www.mdpneumatics.com or contact Customer Service.

M-D Pneumatics®

For Service & Repair, Technical Support, or Product Sales contact:

M-D Pneumatics
4840 West Kearney Street
Springfield, Missouri USA 65803-8702
O 417.865.8715 800.825.6937
F 417.865.2950
www.mdpneumatics.com

MEMBER OF CAGI Compressed Air & Gas Institute

Manual 2010 Rev B p/n 002010 0000
04/21

Tuthill
PUMP YOUR HEART INTO IT

TUTHILL LUBRICANTS

POSITIVE DISPLACEMENT BLOWERS & BOOSTERS

TUTHILL LUBRICANTS

POSITIVE DISPLACEMENT BLOWERS & BOOSTERS

Tuthill positive displacement blowers and boosters are known worldwide for superior quality and performance. Tuthill's MD full synthetic lubricants are specifically formulated for use in Tuthill's high-performing blowers and boosters and is the only lubricant recommended. MD lubricants ensure the highest quality of operation, allowing you to achieve a longer life over mineral oil or semi-synthetic lubricants due to its specific formulation, especially in high temperature conditions. Improper lubrication is one of the main causes of blower and booster failures. Don't take a chance using anything other than MD lubricants by Tuthill.

BENEFITS

- Positive displacement blowers and boosters can often operate at temperatures near 300°F. These extreme operating temperatures require a full synthetic lubricant that is blended from synthetic hydrocarbon polyalphaolefin (PAO) to ensure maximum performance and product life.
- PAOs have greater thermal oxidative stability and a high viscosity index, allowing for greater film strength at higher temperatures and decreased viscosities at low temperatures for minimal friction and better lubrication.
- This PAO synthetic base fluid allows oil to demulsify water in high humidity and water conditions by easily separating water from the fluid. MD full synthetic lubricants provide better rust and corrosion protection for increased equipment life and has the highest 1A rating for copper corrosion under ASTM D130.
- MD full synthetic lubricants contain a formulation of anti-wear and anti-foaming additives that are specifically designed to prolong the life of Tuthill blowers and boosters.
- MD full synthetic lubricants can last up to 5 times longer than mineral oil and twice as long as many semi-synthetic lubricants, meaning fewer oil change intervals, reduced down time, and greater cost savings.
- MD full synthetic lubricants have an average oil life of 8,000-hours at temperatures up to 220°F. Mineral oils oxidize at temperatures as low as 160°F, resulting in an oil life of 1,500-hours.
- MD lubricants have a low coefficient of dynamic friction that substantially reduces power consumption by minimizing gear and bearing friction, resulting in improved efficiency.

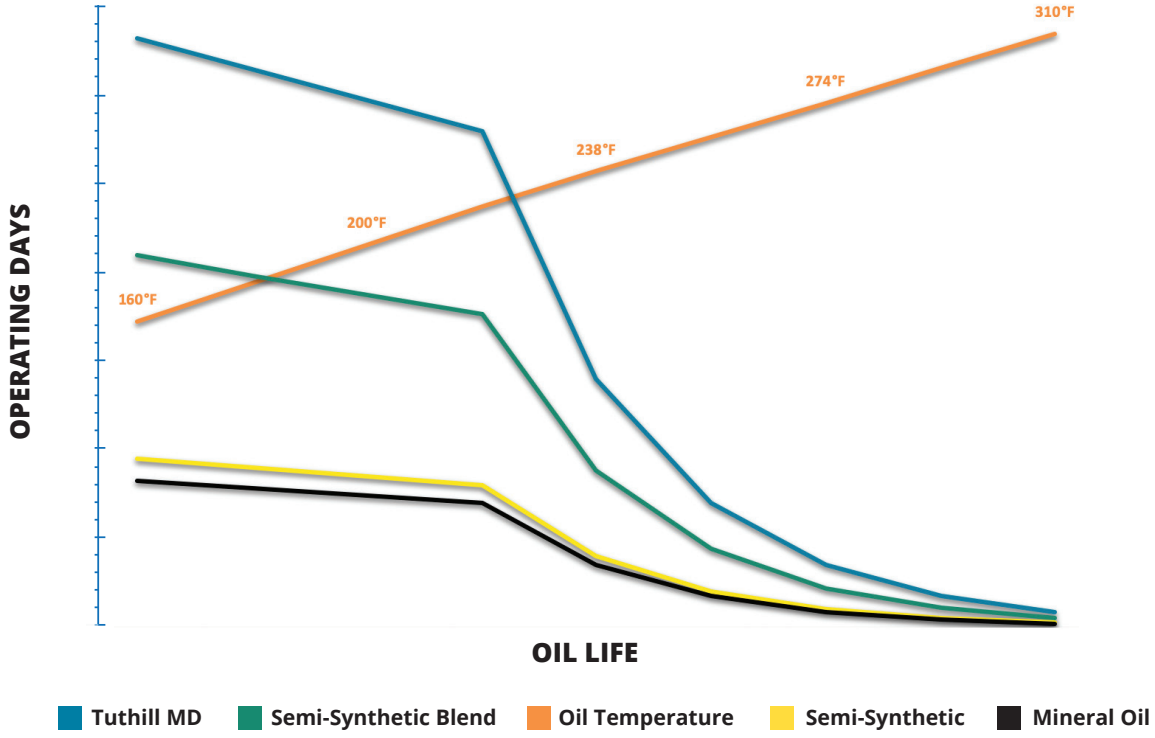
NOT ALL LUBRICANTS PERFORM THE SAME

Blowers and boosters can often operate at high temperatures. The lubricant can equal that of the discharge temperature. Oil life drops by half for every 18°F above 220°F. This is why it is important to use MD lubricants that are formulated to extend oil life, even at high temperatures.

MD LUBRICANTS VS. SEMI-SYNTHETIC & MINERAL OIL

MD LUBRICANTS	SEMI-SYNTHETICS & MINERAL OILS
Contains tailored list of additives for specific product application	Mineral oils do not contain any additional additives that protect the seals, bearings, or gears. Semi-Synthetics may only contain a small amount of additional additives
Higher oxidation resistance, improving lubricity	Lower oxidation resistance, increasing risk of sludge formation
Protects from oxidation at 220°F	Semi-synthetics begins to oxidize at 180°F and mineral oil start oxidizing at only 160°F
PAO based fluids provide higher anti-wear properties resulting in increased product life	Lack of anti-wear properties results in decreased product life
Up to a 30% reduction in cost of oil change intervals over the life of the product	Reduced oil life results in increased oil change intervals and higher overall maintenance cost
Environmentally friendly due to fewer oil changes	Increased disposal costs due to increased oil change intervals

OIL TEMPERATURE VS. OIL LIFE



COST SAVINGS OF USING MD ONE VS SEMI-SYNTHETIC AND MINERAL OIL

MD full synthetic lubricants not only better protect your product from premature failure but you will also save money in reoccurring maintenance costs. The example below shows an initial fill of MD One oil in a Tuthill PD Plus 5511 blower. In 8,000 hours of run time, using a mineral oil or semi-synthetics can cost you up to 3 times the expense.

TUTHILL 5511 BLOWER	MD ONE	SEMI-SYNTHETIC	MINERAL OIL
INITIAL FILL OF OIL (1 GALLON)	$75	$60	$35
LUBE CHANGE INTERVAL	8,000 hrs	4,000 hrs	1,500 hrs
COST OF REPLACEMENT OIL	$0	$60	$140
LABOR ($50/CHANGE)	$50	$100	$250
TOTAL COST	**$125**	**$200**	**$425**

Savings will vary based on individual operating conditions.

MD ONE

MD ONE is a great all-purpose, full synthetic lubricant suited for most blower and booster applications, working well in low or high ambient conditions. It is formulated using synthesized hydrocarbon fluid and select additives to enhance oxidation resistance and provide maximum protection against wear, rust corrosion, and foaming.

MD PLUS

MD PLUS full synthetic lubricant provides significantly better thermal and oxidation stability at higher temperatures. Compared to mineral oil, MD PLUS contains specific additives that reduce oxidation, protect against breakdown of the lubricant, and greatly prolong the life of the oil.

MD MAX

MD MAX full synthetic lubricant provides the highest protection against maximum operating temperatures for blower and booster applications. The viscosity and the additive formulation of MD MAX creates an additional layer of protection for the gears, bearings, and seals to increase durability and maintain adequate endurance in extreme operating conditions.

MD FG (FOOD GRADE)

MD FG is a full synthetic lubricant that is approved by the CFIA and the USDA for H-1 applications that is compliant with FDA 21 CFR 178.3570 requirements. In addition, the MD FG is Halal Certified by the Islamic Food and Nutrition Council of America. MD FG oil is fortified with oxidation inhibitors, corrosion inhibitors, and anti-wear additives to enhance the superior qualities offered by the synthetic hydrocarbon base stock.

MD LITHIUM GREASE

MD LITHIUM GREASE is a multi-purpose grease that is recommended for use in select CP Series blower models. This grease is shear stable with extreme pressure characteristics and outperforms conventional greases. It satisfies nearly all grease requirements found in industrial blower applications.

TUTHILL LUBRICATION RECOMMENDATION

The selection of the correct lubricant is an important decision. The application and operating conditions must be taken into consideration to achieve maximum performance and life of the product. Determination of lubricant should not be decided solely on ambient temperature. Tuthill provides a recommendation tool for its MD lubricants based on discharge temperature, inlet temperature, RPM, and model to better safeguard that you are selecting the right lubricant. The chart below is for informational guidance only. Contact Tuthill or a Tuthill Representative for assistance in choosing the best lubricant for your specific application and operating conditions.

RPM \ DISCHARGE TEMPERATURE (°F)	150	170	190	210	230	250	270	290	310	330	350
1150	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX	MD MAX	MD MAX
1395	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX	MD MAX	MD MAX
1640	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX	MD MAX	MD MAX
1885	MD ONE	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX
2130	MD ONE	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX
2375	MD ONE	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX
2620	MD ONE	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX
2865	MD ONE	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX
3110	MD ONE	MD ONE	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX
3355	MD ONE	MD ONE	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX
3600	MD ONE	MD ONE	MD ONE	MD ONE	MD PLUS	MD PLUS	MD PLUS	MD MAX	MD MAX	MD MAX	MD MAX

MD BLOWER & BOOSTER LUBRICANTS SPECIFICATIONS:

PRODUCTS	MD ONE	MD PLUS	MD MAX	MD FG
VISCOSITY INDEX	150	154	157	141
@40°C, CST	99.1	231.7	340.9	99.3
@100°C, CST	14.4	27.6	37.2	13.9
FLASH POINT °F (°C)	510 (266)	480 (249)	491 (255)	515 (268)
POUR POINT °F (°C)	-44 (-43)	-49 (-45)	-54 (-48)	-60 (-51)

ORDERING MADE EASY

Tuthill lubricants are available in a variety of convenient quantities and sizes. Contact your local Tuthill Distributor or order at **tvbsinquiries@tuthill.com.**

	QUART	GALLON	5 GALLON	55 GALLON BARREL	CASE - 12 QUARTS
MD ONE	16444-MD1-Q	16444-MD1-G	16444-MD1-5G	16444-MD1-B	16444-MD1-Q-C
MD PLUS	16444-MD2-Q	16444-MD2-G	16444-MD2-5G	16444-MD2-B	16444-MD2-Q-C
MD MAX	16444-MD3-Q	16444-MD3-G	16444-MD3-5G	16444-MD3-B	16444-MD3-Q-C
MD FG	16444-MD1-Q-FG	16444-MD1-G-FG	16444-MD1-5G-FG	16444-MD1-B-FG	16444-MD1-Q-C-FG

OIL ANALYSIS

Anticipate complications and avoid downtime by using Tuthill's Oil Sampling Program that provides a comprehensive laboratory analysis of the physical and chemical characteristics of your oil over a select period of time. The analysis is designed to determine lubricant deterioration, suggest a frequency for lubricant renewal, and detect any mechanical complications prior to disrepair. These benefits can be realized through creation of your own trend analysis over a series of 3-4 samples.

Each oil sample kit contains supplies to collect four different oil samples. The provided packaging material makes sending your oil sample to the laboratory easy. You will receive timely results which will enable you to make prompt maintenance decisions regarding your equipment and oil. Purchase your Tuthill oil analysis kit by ordering part number 19266.

If you have any questions or concerns regarding your analysis, you may contact us at:

tvbsinquiries@tuthill.com

Tuthill
PUMP YOUR HEART INTO IT

CONTACT US

TUTHILL SPRINGFIELD
4840 W. KEARNEY STREET
SPRINGFIELD, MO 65803
TEL: (800) 825-6937
TVBSINQUIRIES@TUTHILL.COM

MEMBER OF CAGI Compressed Air & Gas Institute

ISO 9001

MADE IN USA

FOR A COMPLETE LISTING OF SALES OFFICES AND LOCAL SALES REPRESENTATIVES VISIT: TUTHILLVACUUMBLOWER.COM

THE HEART IS THE ORIGINAL PUMP

All of us are born with a pump inside – our hearts. At Tuthill, we don't just make pumps, meters, and vacuum systems & blowers, we make an invitation for the original pump – the heart – to come alive.

We've always been a company with heart. From our beginnings as a brick maker, we made the bricks that made Chicago. As the horses hauled clay from the quarry, it was too much for their hearts to bear. So Tuthill created an oil pump to power a truck, an innovation that saved horses and led to our first manufactured pump – made from the heart.

Today, we pump our hearts into everything we do: every cut, drill, and cycle, and everything we bring to you. We invite you to join us and find what makes your heart beat a little faster. Because when we all come alive, the world comes along. Learn more at tuthill.com

PRODUCT INFORMATION PACKET

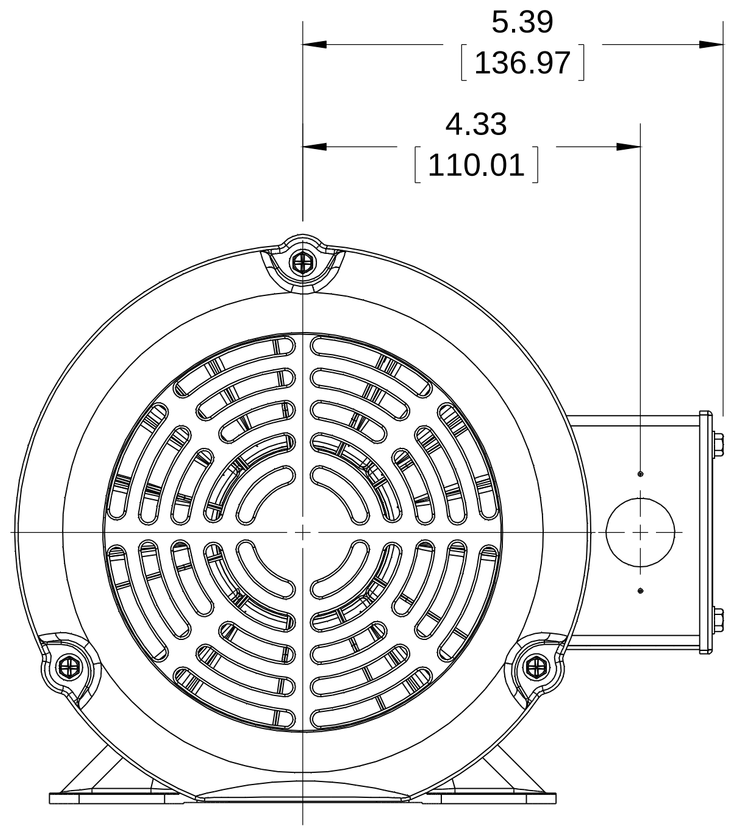
Model No: LM32796
Catalog No: LM32796
1 HP General Purpose Motor, 3 phase, 1800 RPM, 230/460 V, 143T Frame, TEFC
Three Phase TEFC Motors

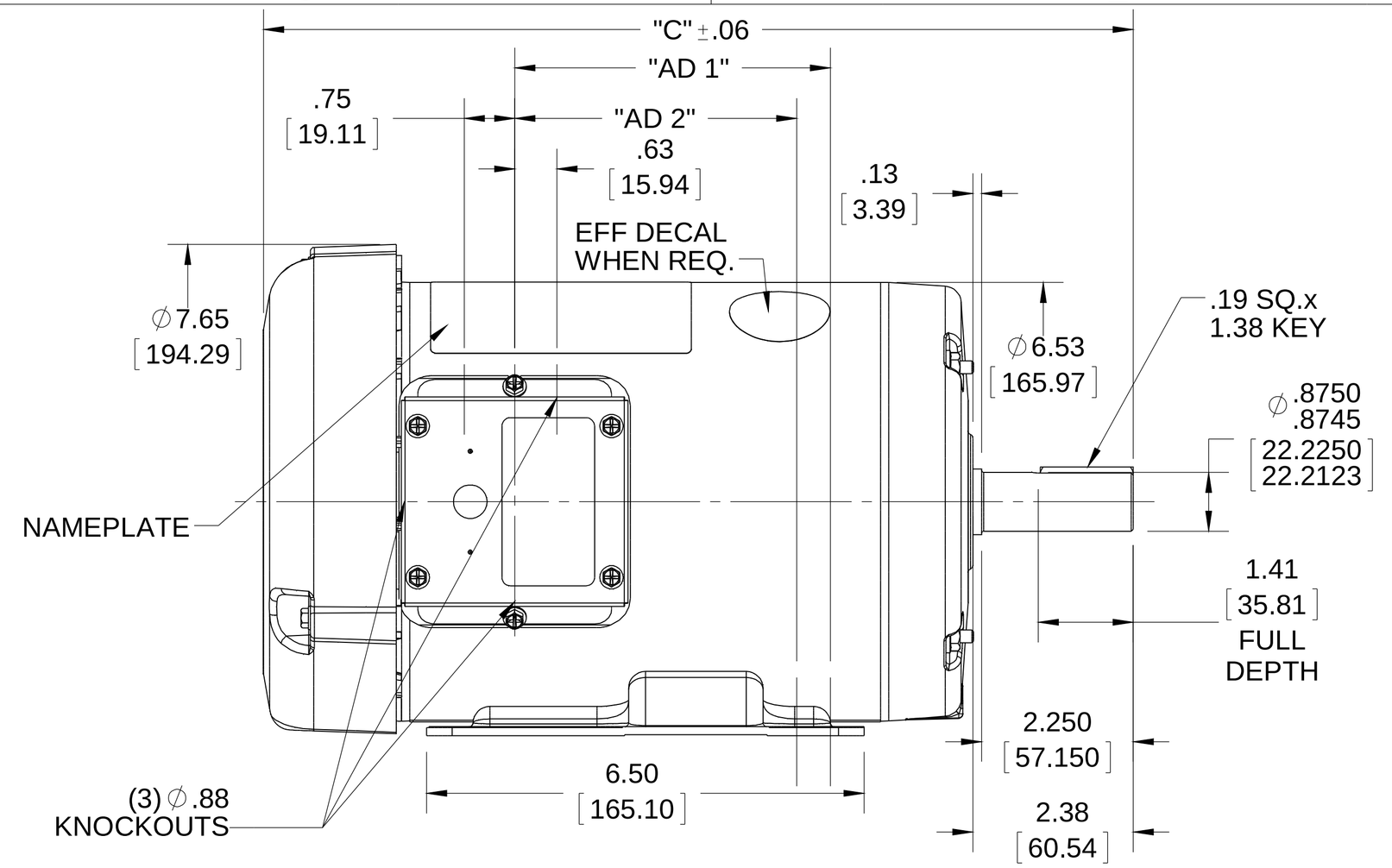
Nameplate Specifications

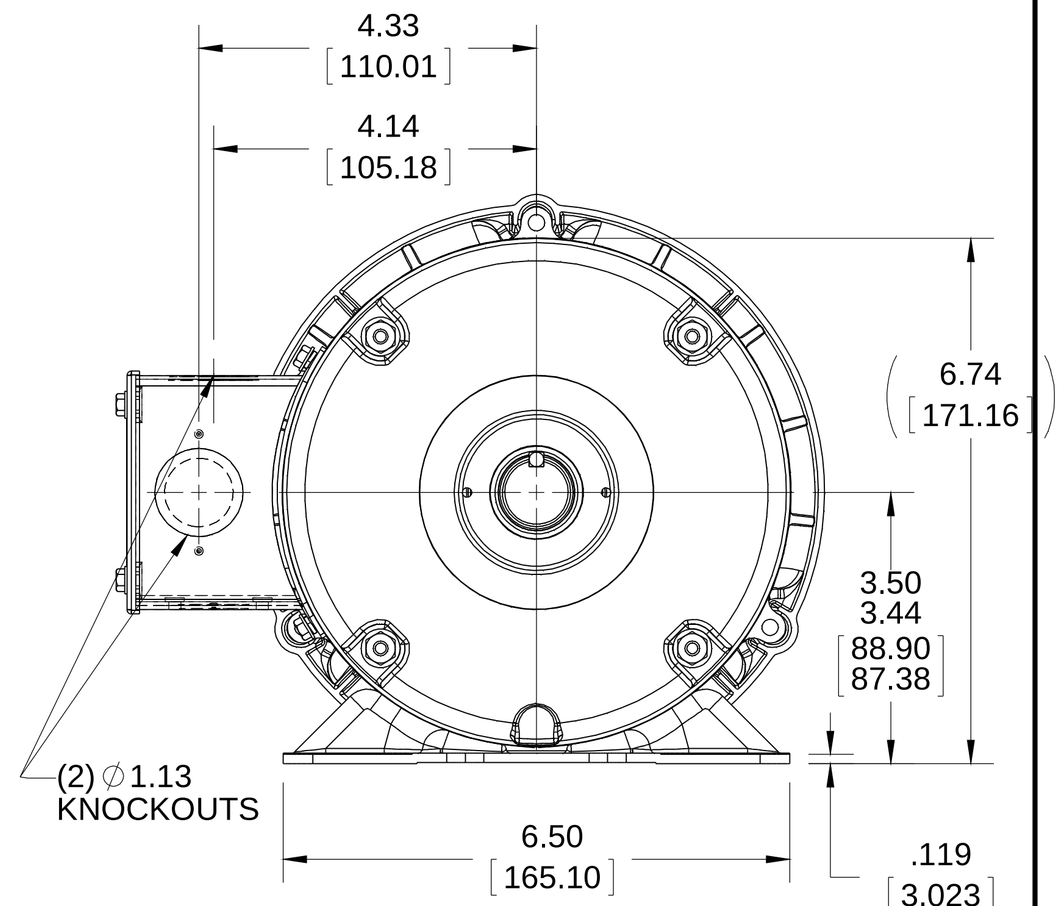
Output HP	**1 Hp**	Output KW	**0.75 kW**
Frequency	**60 Hz**	Voltage	**230/460 V**
Current	**3.2-3.2/1.6 A**	Speed	**1760 rpm**
Service Factor	**1.25**	Phase	**3**
Efficiency	**85.5 %**	Power Factor	**68.5**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**N**
Frame	**143T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6205**	Opp Drive End Bearing Size	**6203**
UL	**Recognized**	CSA	**Y**
CE	**Y**	IP Code	**43**

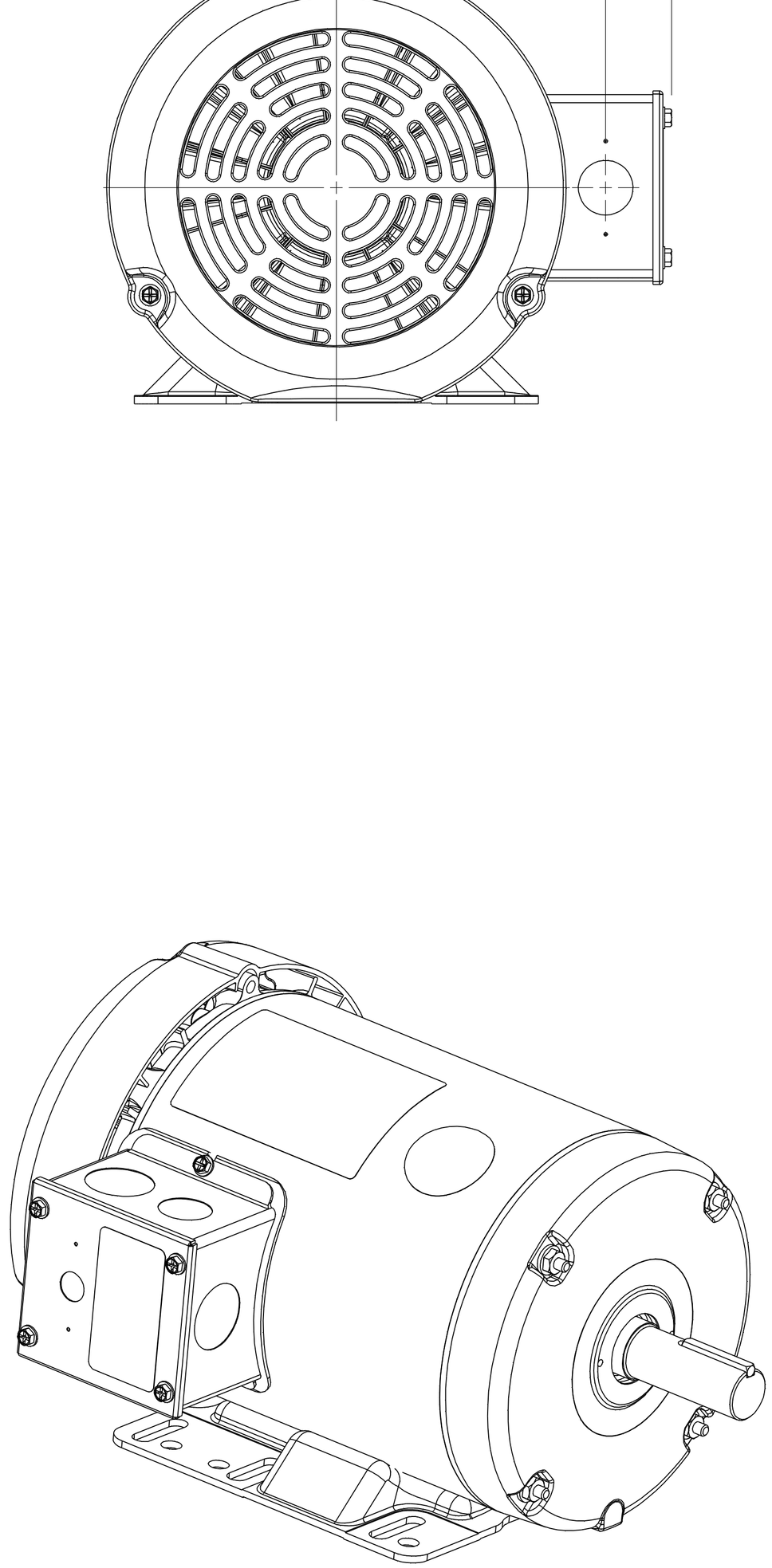
Technical Specifications

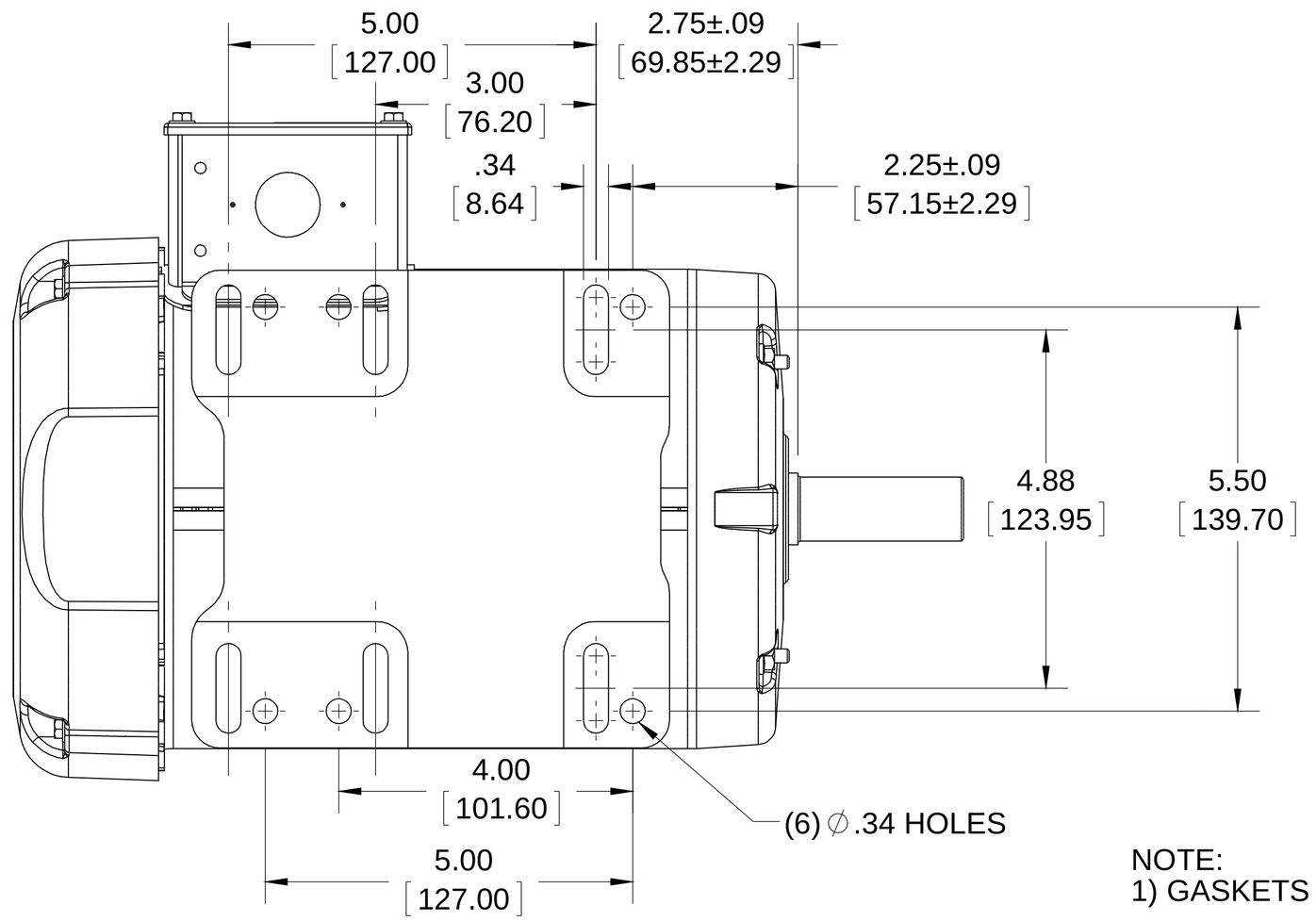
Electrical Type	**Squirrel Cage Induction Run**	Starting Method	**Across The Line**
Poles	**4**	Rotation	**Reversible**
Resistance Main	**12.96 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Rolled Steel**
Shaft Type	**T**	Overall Length	**12.93 in**
Frame Length	**7.00 in**	Shaft Diameter	**0.875 in**
Shaft Extension	**2.25 in**	Assembly/Box Mounting	**F1 ONLY**
Connection Drawing	**005010.01LN**	Outline Drawing	**028765-700**











NOTE:
1) GASKETS THROUGHOUT

ORACLE REV	10

DASH NO.	"C"	"AD 1"	"AD 2"
600	11.93	3.69	3.19
650	12.43	4.19	3.69
675	12.68	4.44	3.94
700	12.93	4.69	4.19
725	13.18	4.94	4.44
750	13.43	5.19	4.69
800	13.93	5.69	5.19
850	14.43	6.19	5.69

DRAWING REVISION	REVISION BY	DATE
H	LST	4/10/15
ECO	APPROVED BY	DATE
ECO-0075607	SK	8/17/2014
ECO DESCRIPTION		
UPDATE DASH TABLE		

TOLERANCES UNLESS OTHERWISE SPECIFIED:

DEC.	INCH	mm	ANGLE
.X	±0.1	[±2.5]	±0.5°
.XX	±0.03	[±0.76]	
XXX	±0.005	[±0.127]	
.XXXX	±0.0005	[±0.0127]	

REMOVE BURRS & BREAK SHARP EDGES: .003/.015 [.076/.381]
CORNER FILLETS: .02 [.51]
MACHINED SURFACES: 125 INCH / 3.2 mm
mm SHOWN IN [BRACKETS]

DRAWN BY	JJK
DATE	06/13/07
APPROVED BY	
DATE	
REFERENCE	034941
THIRD ANGLE PROJECTION	

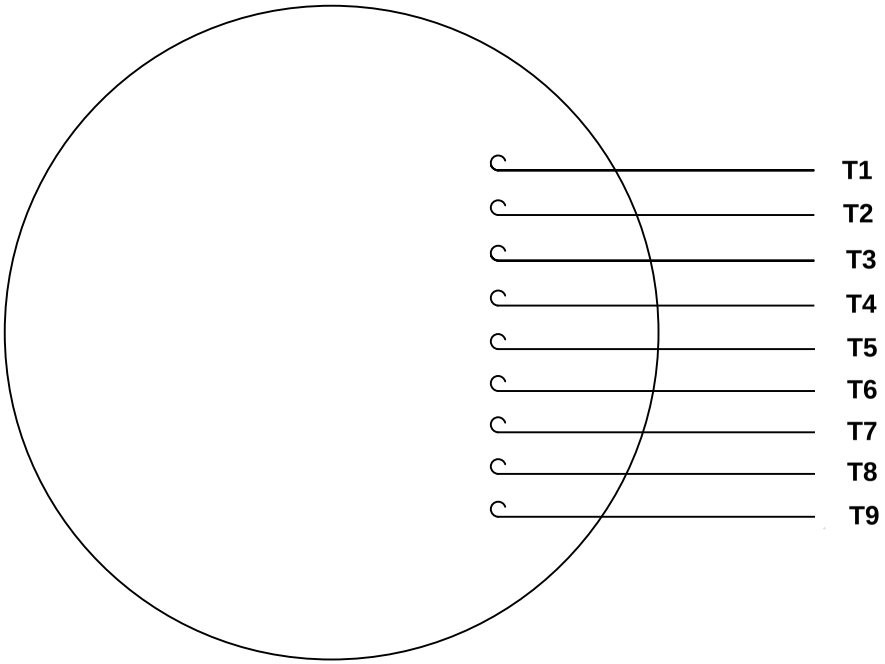
REGAL™ Regal Beloit America, Inc.

DESCRIPTION
OUTLINE
140T/56HZ FRAME TEFC - RIGID

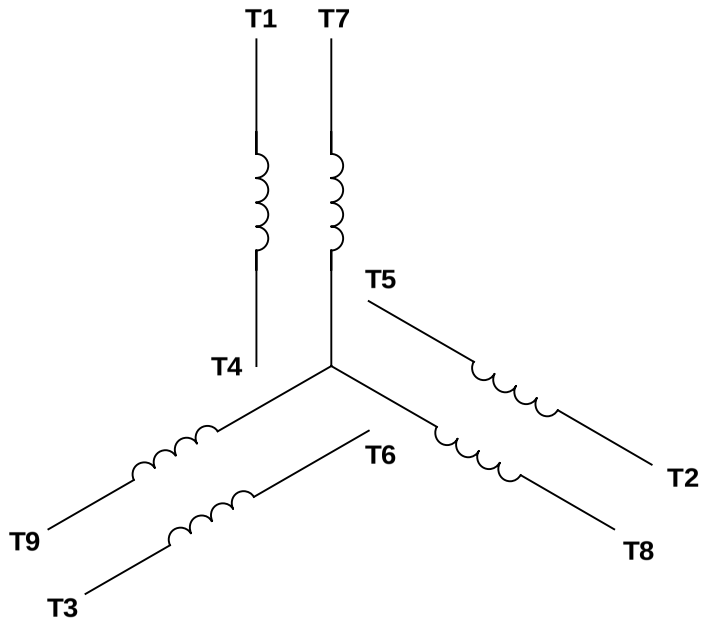
MATERIAL	PROCESS/FINISH
	GENERAL PURPOSE

SIZE	DRAWING NUMBER	SHEET
B	028765	1 OF 1

VIEW FROM OUTSIDE OF MOTOR AT SWITCH END.



LINE LEADS



VOLTAGE	L1	L2	L3	JOIN & INSULATE
HIGH	T1	T2	T3	(T4,T7) (T5,T8) (T6,T9)
LOW	T1,T7	T2,T8	T3,T9	T4,T5,T6

NO	REVISION	BY & DATE	CHK
--	REDRAWN IN SOLIDWORKS	VJB 02/08/11	

TOLERANCES UNLESS SPECIFIED
DEC INCHES
.X ±.1
.XX ±.01
.XXX ±.005
.XXXX ±.0005
ANG ±1/2°

THIRD ANGLE PROJECTION

RFP 04/12/02
NETWORK FILE NAME 00501001LN

Lincoln MOTORS

TITLE EXTERNAL WIRING DIAGRAM
3 PHASE W/O PROTECTOR
MAT'L DECAL - 004014
FINISH
PREV

DRAWN KMM 04/16/02
CHK
APPR
SCALE 1:1
REF FIG. 2-51
FMF
PAGE OF

SIZE A
DRAWING NO 005010-01LN
REV --

Data Sheet

Date: 1/30/2018

LEESON

LM32796

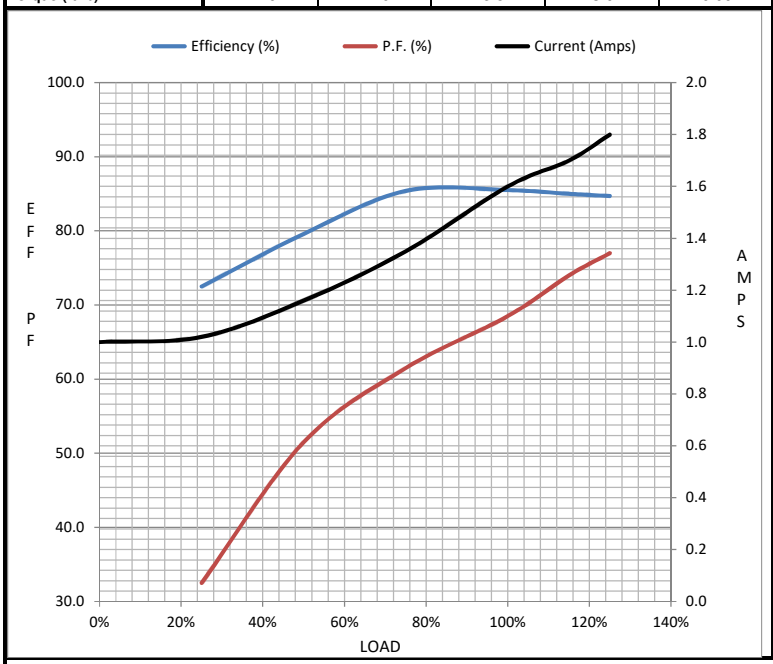
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	1.00	1.02	1.16	1.35	1.60	1.70	1.80	14.0	
Torque (ft-lb)	0.00	0.75	1.50	2.25	3.0	3.5	3.8	12.0	
RPM	1800	1789	1779	1769	1760	1,750	1745	0	
Efficiency (%)		72.5	79.6	85.4	85.5	85.0	84.7		
P.F. (%)	8.0	32.5	51.5	61.5	68.5	74.0	77.0	41.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1170	1760	1800
Current (Amps)	14.0	13.0	9.9	1.60	1.00
Torque (ft-lb)	12.0	11.9	15.8	3.0	0.00



Information Block

HP	1.0
Sync. RPM	1800
Frame	140
Enclosure	TEFC
Construction	TFR
Voltage	230/460#190-208/380-415 V
Frequency	60 Hz
Design	B
LR Code letter	N
Service Factor	1.15
Temp Rise @ FL	38 °C
Duty	CONT
Ambient	40 °C
Elevation	1,000 feet
Rotor/Shaft wk²	0.12 Lb-Ft²
Ref Wdg	T634342 FR
Sound Pressure @ 1M	65 dBA
VFD Rating	NONE
Outline Dwg	028765-700
Conn. Diag	005010.01LN

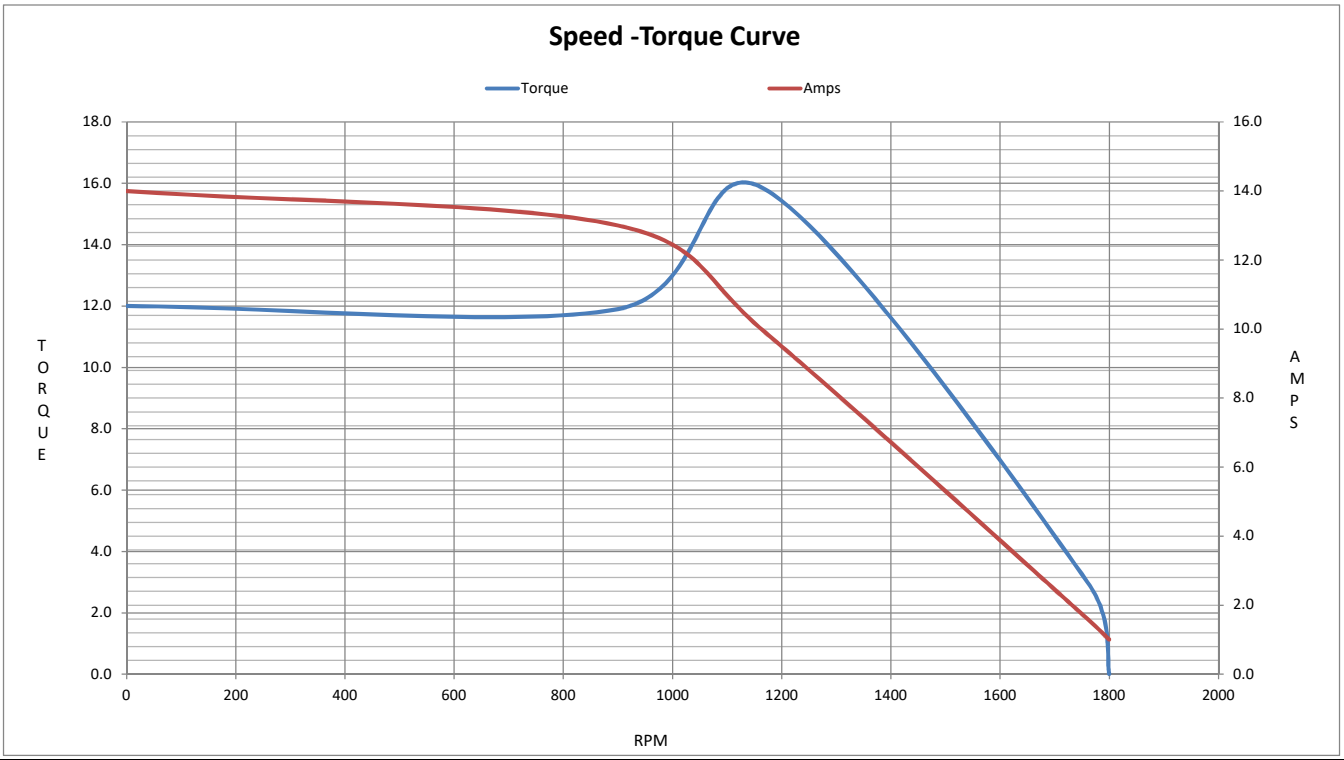
Additional Specifications:

0

0

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0000	0.0000	0.0000	0.0000	0.0000



PRODUCT INFORMATION PACKET

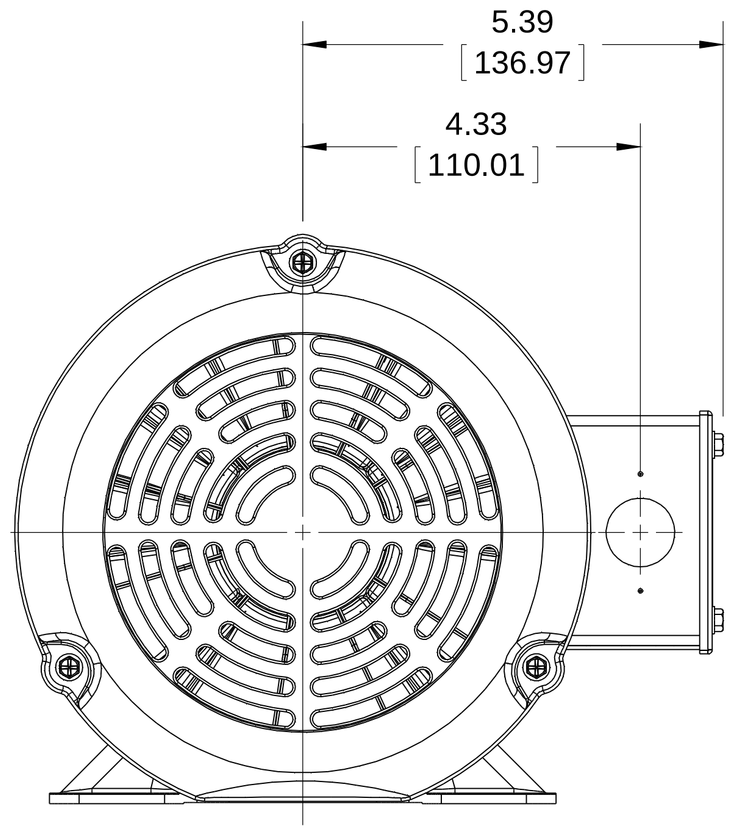
Model No: LM33123
Catalog No: LM33123
1.50 HP General Purpose Motor, 3 phase, 1800 RPM, 230/460 V, 145T Frame, TEFC
Three Phase TEFC Motors

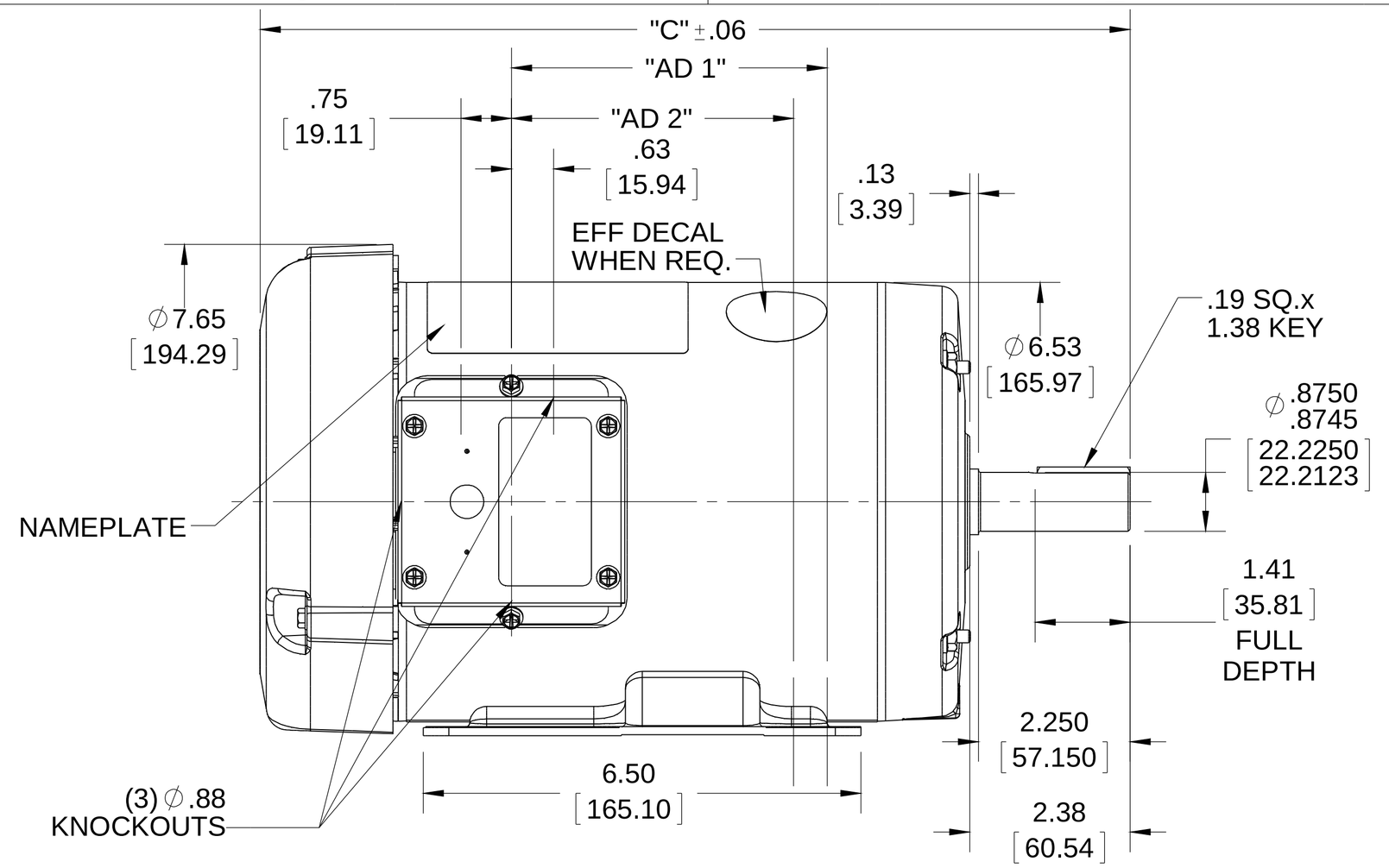
Nameplate Specifications

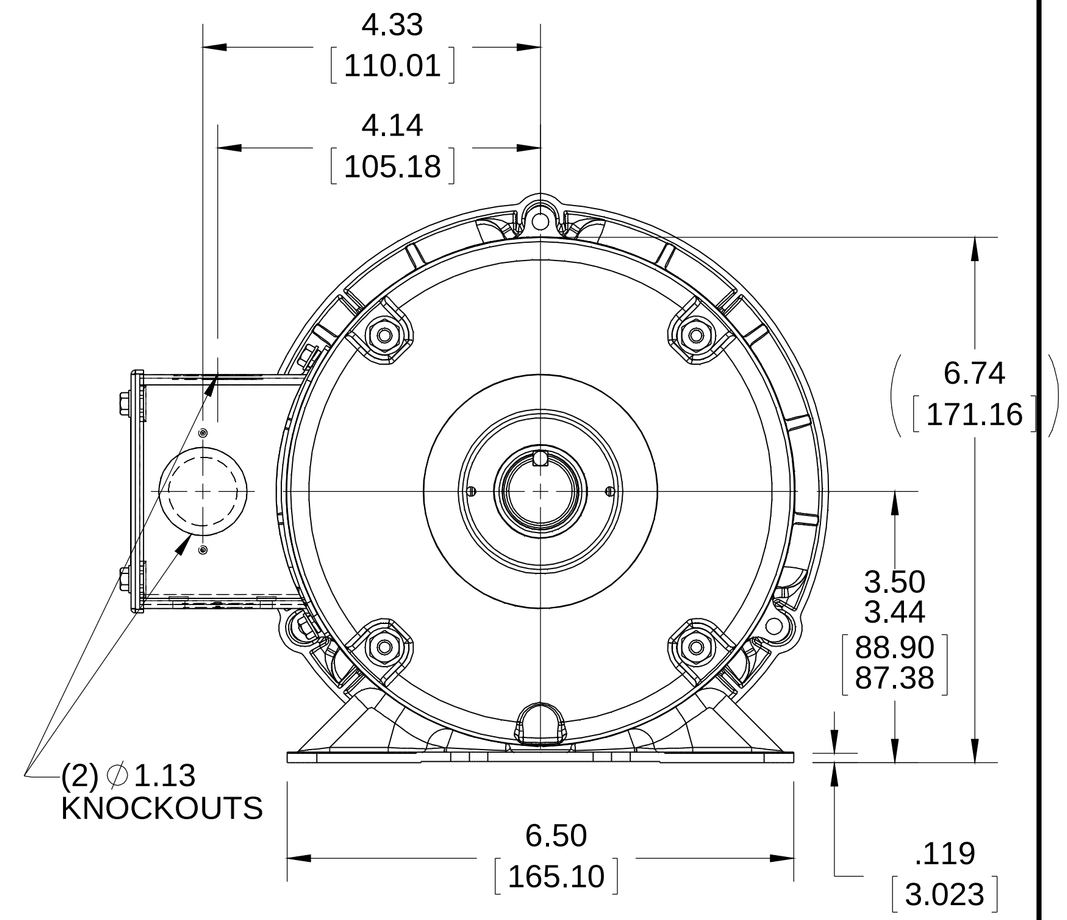
Output HP	**1.50 Hp**	Output KW	**1.1 kW**
Frequency	**60 Hz**	Voltage	**230/460 V**
Current	**4.8/2.4 A**	Speed	**1750 rpm**
Service Factor	**1.25**	Phase	**3**
Efficiency	**86.5 %**	Power Factor	**67.7**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**L**
Frame	**145T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6205**	Opp Drive End Bearing Size	**6203**
UL	**Recognized**	CSA	**Y**
CE	**N**	IP Code	**43**

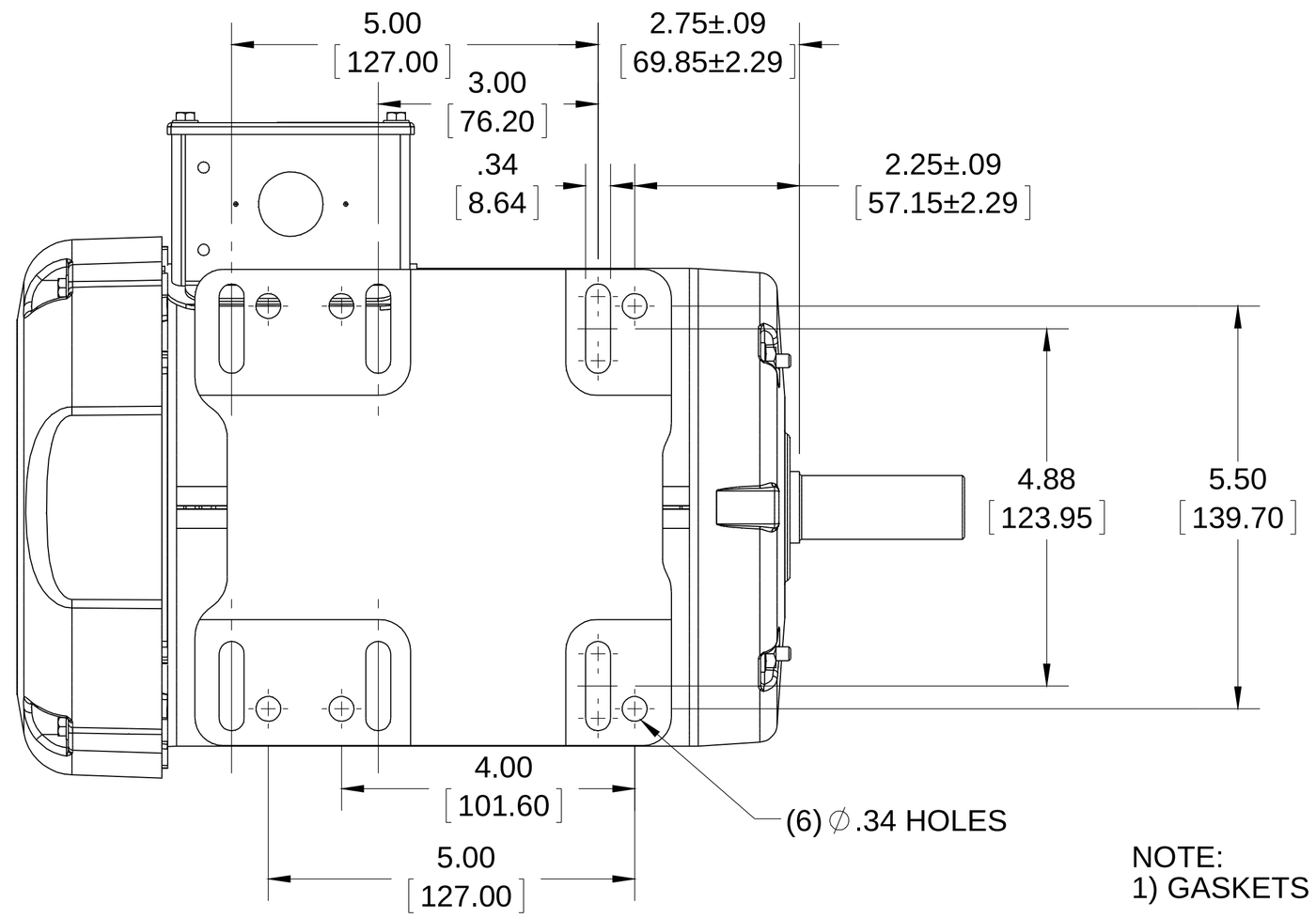
Technical Specifications

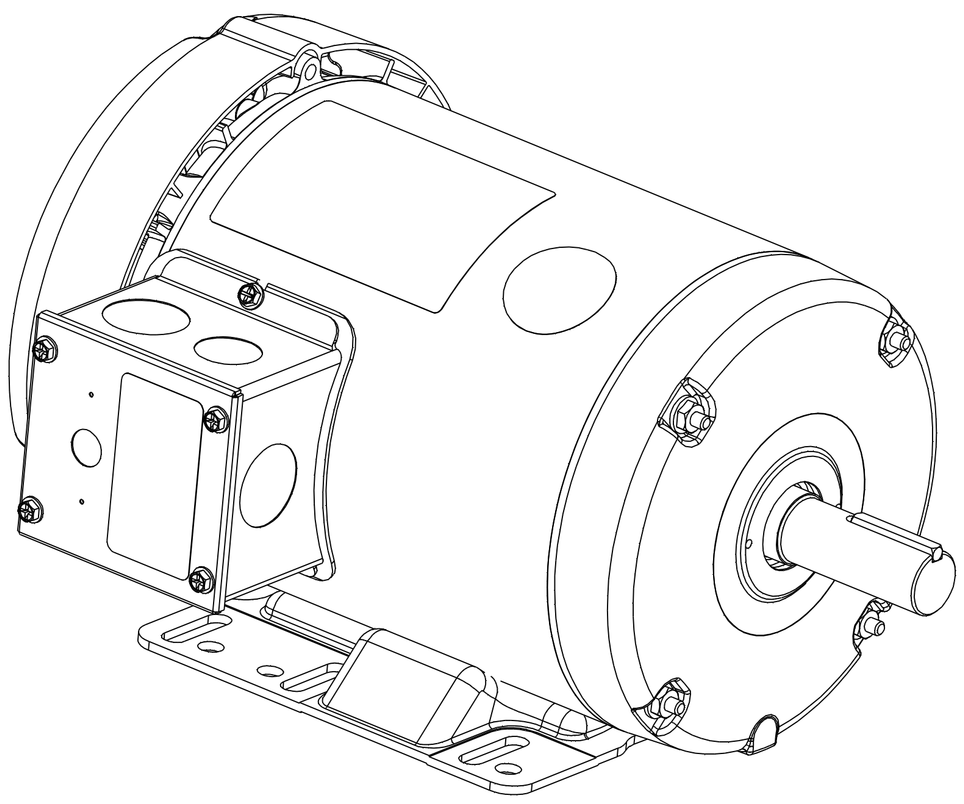
Electrical Type	**Squirrel Cage Induction Run**	Starting Method	**Across The Line**
Poles	**4**	Rotation	**Reversible**
Resistance Main	**9.12 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Rolled Steel**
Shaft Type	**T**	Overall Length	**13.43 in**
Frame Length	**7.50 in**	Shaft Diameter	**0.875 in**
Shaft Extension	**2.25 in**	Assembly/Box Mounting	**F1 ONLY**
Outline Drawing	**028765-750**	Connection Drawing	**005010.01LN**











NOTE:
1) GASKETS THROUGHOUT

	ORACLE REV	10

DASH NO.	"C"	"AD 1"	"AD 2"
600	11.93	3.69	3.19
650	12.43	4.19	3.69
675	12.68	4.44	3.94
700	12.93	4.69	4.19
725	13.18	4.94	4.44
750	13.43	5.19	4.69
800	13.93	5.69	5.19
850	14.43	6.19	5.69

DRAWING REVISION	REVISION BY	DATE
H	LST	4/10/15
ECO	APPROVED BY	DATE
ECO-0075607	SK	8/17/2014
ECO DESCRIPTION		
UPDATE DASH TABLE		

TOLERANCES UNLESS OTHERWISE SPECIFIED:

DEC.	INCH	mm	ANGLE
.X	±0.1	[±2.5]	±0.5°
.XX	±0.03	[±0.76]	
XXX	±0.005	[±0.127]	
.XXXX	±0.0005	[±0.0127]	

REMOVE BURRS & BREAK SHARP EDGES: .003/.015 [.076/.381]
CORNER FILLETS: .02 [.51]
MACHINED SURFACES: 125 INCH / 3.2 mm
mm SHOWN IN [BRACKETS]

DRAWN BY	JJK
DATE	06/13/07
APPROVED BY	
DATE	
REFERENCE	034941
THIRD ANGLE PROJECTION	

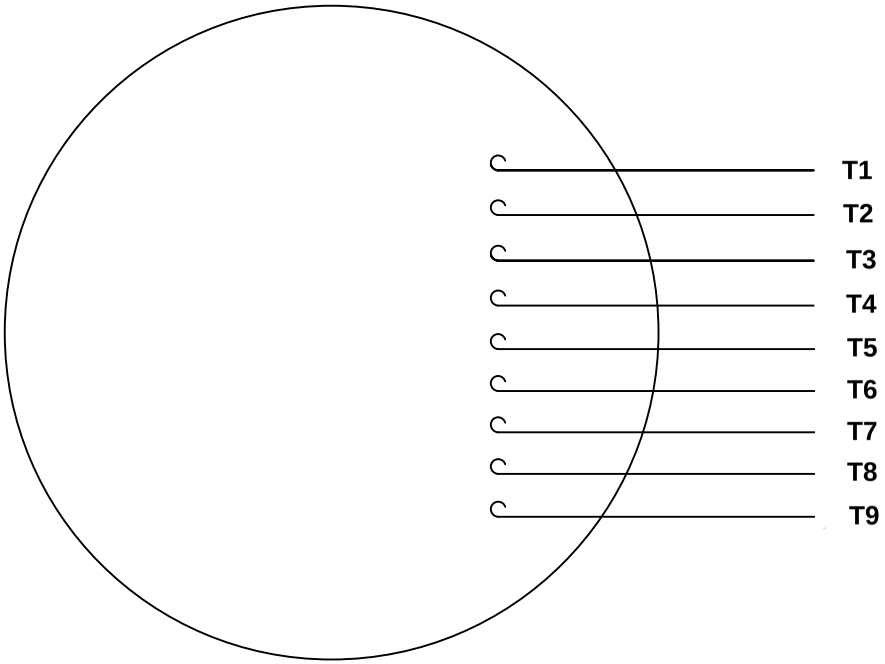
Regal Beloit America, Inc.

DESCRIPTION
OUTLINE
140T/56HZ FRAME TEFC - RIGID

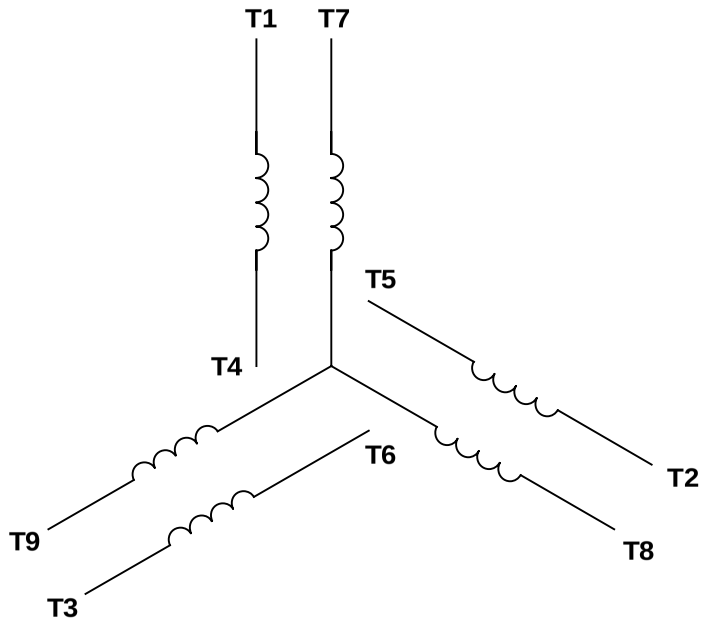
MATERIAL	PROCESS/FINISH
	GENERAL PURPOSE

SIZE	DRAWING NUMBER	SHEET
B	028765	1 OF 1

VIEW FROM OUTSIDE OF MOTOR AT SWITCH END.



LINE LEADS



VOLTAGE	L1	L2	L3	JOIN & INSULATE
HIGH	T1	T2	T3	(T4,T7) (T5,T8) (T6,T9)
LOW	T1,T7	T2,T8	T3,T9	T4,T5,T6

NO	REVISION	BY & DATE	CHK
--	REDRAWN IN SOLIDWORKS	VJB 02/08/11	

TOLERANCES UNLESS SPECIFIED
DEC INCHES
.X ±.1
.XX ±.01
.XXX ±.005
.XXXX ±.0005
ANG ±1/2°

THIRD ANGLE PROJECTION

Lincoln MOTORS

TITLE EXTERNAL WIRING DIAGRAM
3 PHASE W/O PROTECTOR

MAT'L DECAL - 004014
FINISH
RFP 04/12/02
NETWORK FILE NAME 00501001LN
PREV

DRAWN KMM 04/16/02
CHK
APPR
SCALE 1:1
REF FIG. 2-51
FMF
PAGE OF

SIZE A
DRAWING NO 005010-01LN
REV --

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

DATA VOLTS: 460

CERTIFICATION DATA SHEET

CONN. DIAGRAM: 005010.01LN **CAT #:** LM33123
OUTLINE: 028765-750
WINDING: T634341 FR 3

TYPICAL MOTOR PERFORMANCE DATA

HP	KW	SYNC RPM	FL RPM	FRAME	ENCLOSURE	TYPE	KVA CODE	DESIGN
1.5	1.1	1800	1750	145T	TEFC	TFR	L	B

PH	HZ	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB	ELEV.
3	60/50	230/460#190/380	4.3/2.15&3.6/1.8	ACROSS THE LINE	CONT	F	1.15	40	3300

F.L. EFF	86.5	3/4 LD EFF	87.2	1/2 LD EFF	84.0	GTD EFF	ELECT. TYPE
F.L. PF	67.7	3/4 LD PF	63.0	1/2 LD PF	55.0	0.0	SQ CAGE IND RUN

F.L. TORQUE	LR AMPS @ 460 V	L.R. TORQUE	B.D. TORQUE	F.L. RISE (°C)
4.5 LB-FT	18.5	17.2 LB-FT 382%	20.4 LB-FT 453%	45

PRESSURE @ 3	POWER	ROTOR WK²	MAX. LOAD WK²	SAFE STALL TIME	STARTS/HOUR	MOTOR WGT
65 dBA	74 dBA	0.14 LB-FT²	0.1 LB-FT²	10 SEC.	3	0 LB.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	MOTOR ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	NO	NONE	NO	NONE	GRAY - LINCOLN

BEARINGS DE	BEARINGS ODE	GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
BALL 6205	BALL 6203	POLYREX EM	T	NONE	NONE	1144 STRESSPROOF (C-223)	ROLLED STEEL

THERMOSTATS	PROTECTORS	WDG RTD's	BRG RTD's	THERMISTORS	CONTROL	SPACE HEATERS
NONE	NOT	NONE	NONE	NONE	FALSE	NA

R1 (ohms/ph)	R2 (ohms/ph)	X1 (ohms/ph)	X2 (ohms/ph)	Xm (ohms/ph)	VIBRATION (in/sec)	FLOAT
0	0	0	0	0	0.150	ODE

NOTES
*
*
*

INVERTER TORQUE: NONE
INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE
NONE NONE **PPR**

BRAKE: NONE
NONE NONE
FT-LB: NA
VOLTAGE: NONE **HZ:**
UL: Y-(LEESON UL REC)

DATE: 1/29/2018

Data Sheet

Date: 1/29/2018

LEESON

LM33123

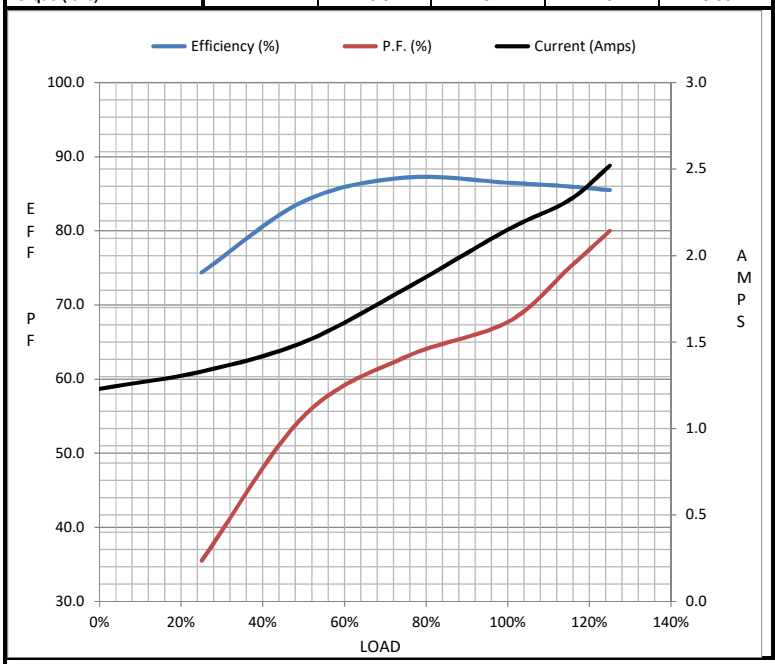
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	1.23	1.33	1.50	1.81	2.15	2.32	2.52	18.5	
Torque (ft-lb)	0.00	1.10	2.25	3.4	4.5	5.2	5.6	17.2	
RPM	1800	1785	1772	1760	1750	1,738	1732	0	
Efficiency (%)		74.4	84.0	87.2	86.5	86.0	85.5		
P.F. (%)	9.9	35.5	55.0	63.0	67.7	75.0	80.0	48.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1600	1750	1800
Current (Amps)	18.5	16.1	12.1	2.15	1.23
Torque (ft-lb)	17.2	16.0	20.4	4.5	0.00



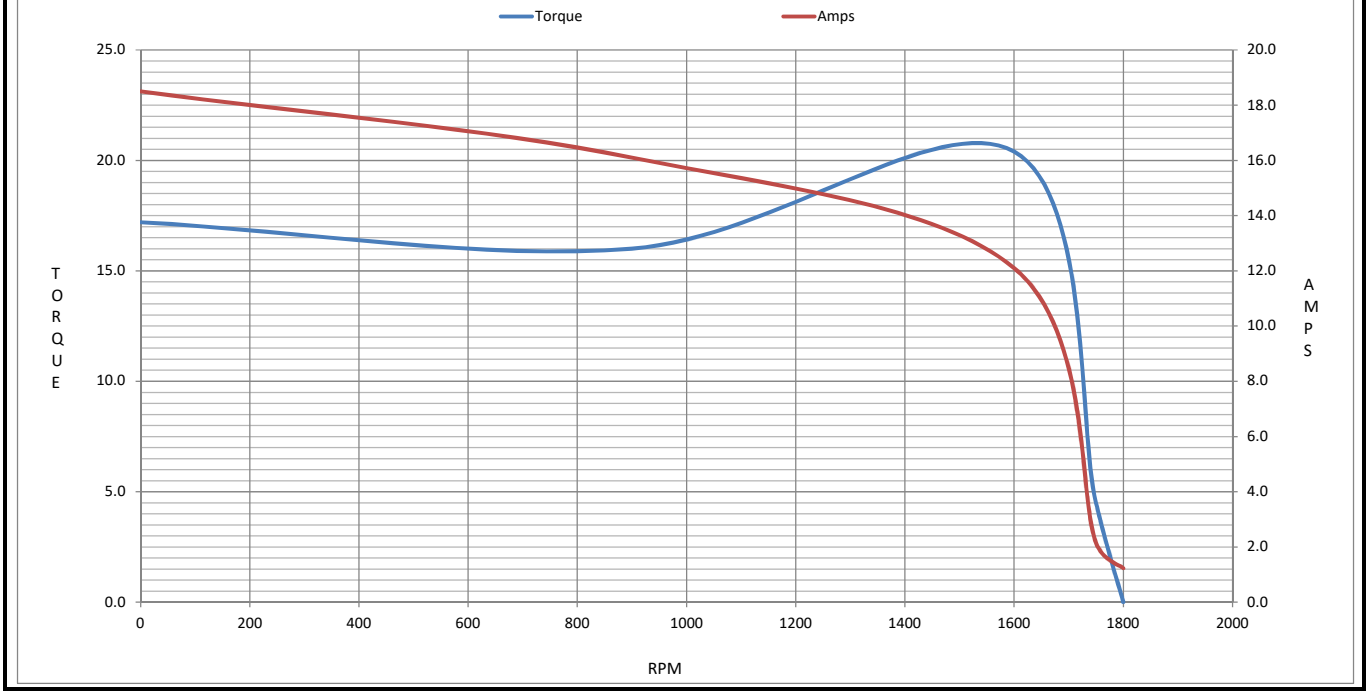
Information Block

HP	1.5	
Sync. RPM	1800	
Frame	140	
Enclosure	TEFC	
Construction	TFR	
Voltage	230/460#190/380	V
Frequency	60	Hz
Design	B	
LR Code letter	L	
Service Factor	1.15	
Temp Rise @ FL	45	° C
Duty	CONT	
Ambient	40	° C
Elevation	1,000	feet
Rotor/Shaft wk²	0.14	Lb-Ft²
Ref Wdg	T634341 FR	
Sound Pressure @ 1M	65	dBA
VFD Rating	NONE	
Outline Dwg	028765-750	
Conn. Diag	005010.01LN	
Additional Specifications:		
0		
0		

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0000	0.0000	0.0000	0.0000	0.0000

Speed -Torque Curve



PRODUCT INFORMATION PACKET

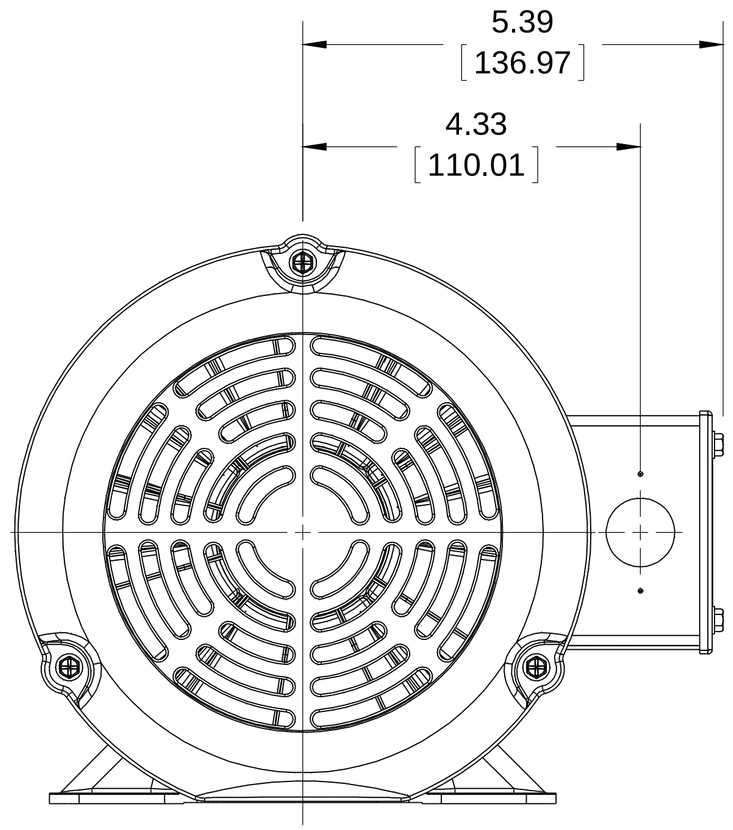
Model No: LM33125
Catalog No: LM33125
2 HP General Purpose Motor, 3 phase, 1800 RPM, 230/460 V, 145T Frame, TEFC
Three Phase TEFC Motors

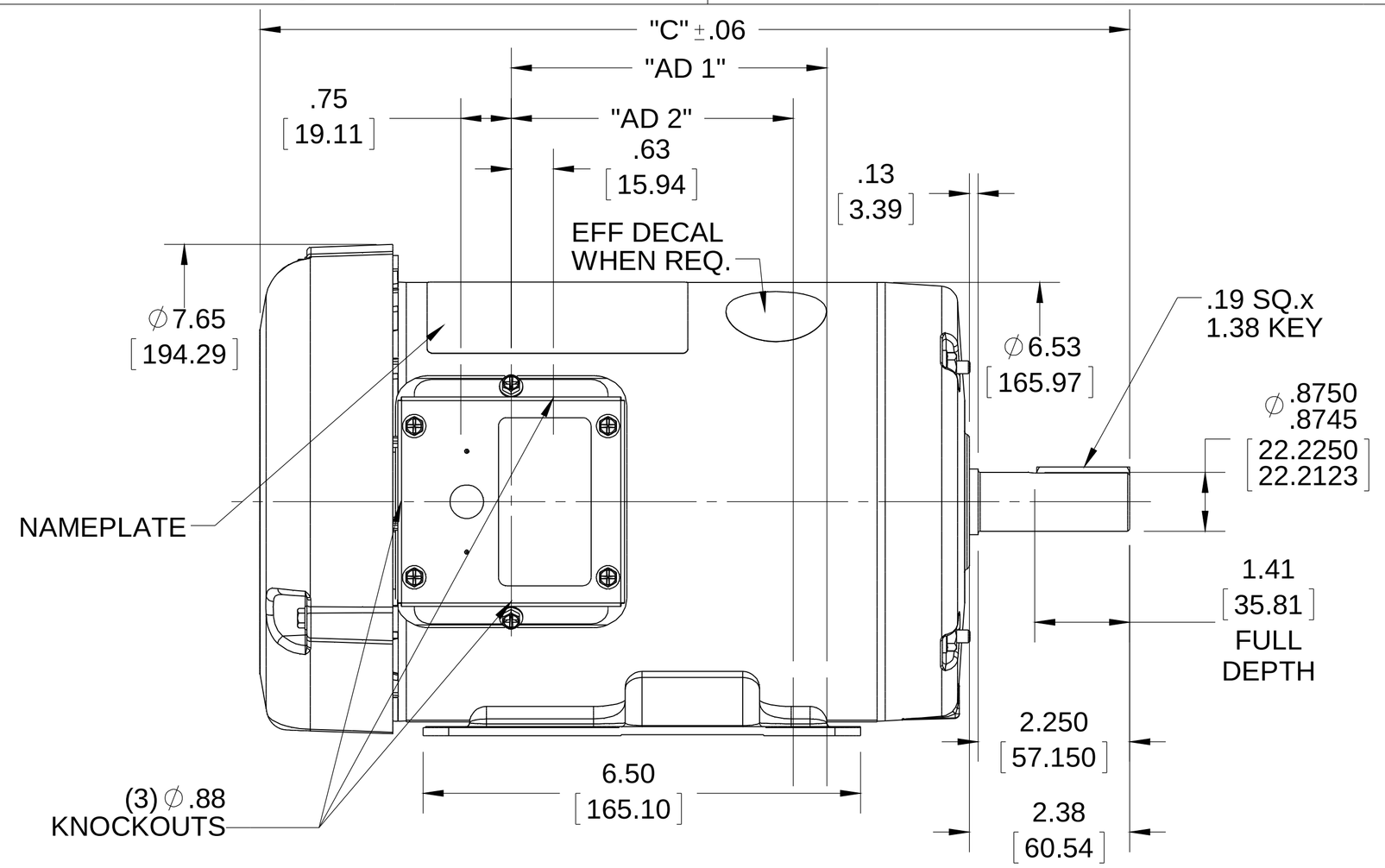
Nameplate Specifications

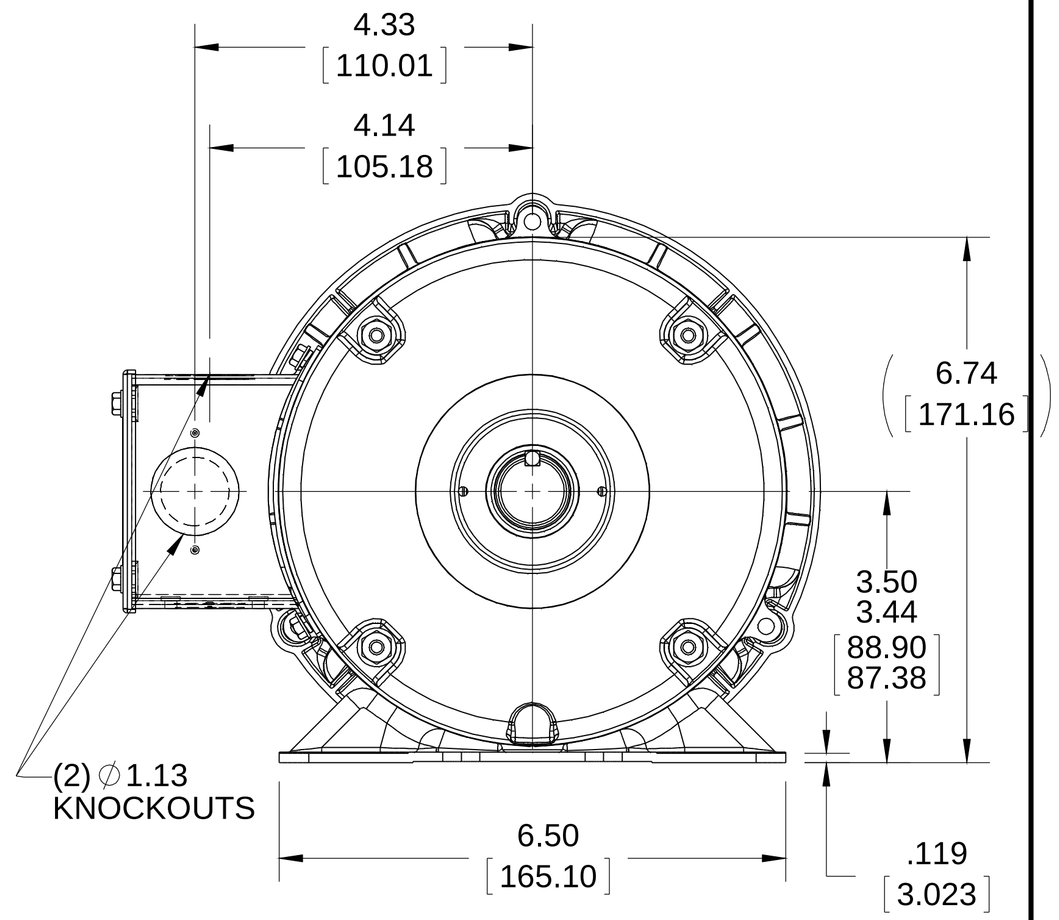
Output HP	**2 Hp**	Output KW	**1.5 kW**
Frequency	**60 Hz**	Voltage	**230/460 V**
Current	**5.8/2.9 A**	Speed	**1725 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**86.5 %**	Power Factor	**75.6**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**L**
Frame	**145T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6205**	Opp Drive End Bearing Size	**6203**
UL	**Recognized**	CSA	**Y**
CE	**Y**	IP Code	**43**

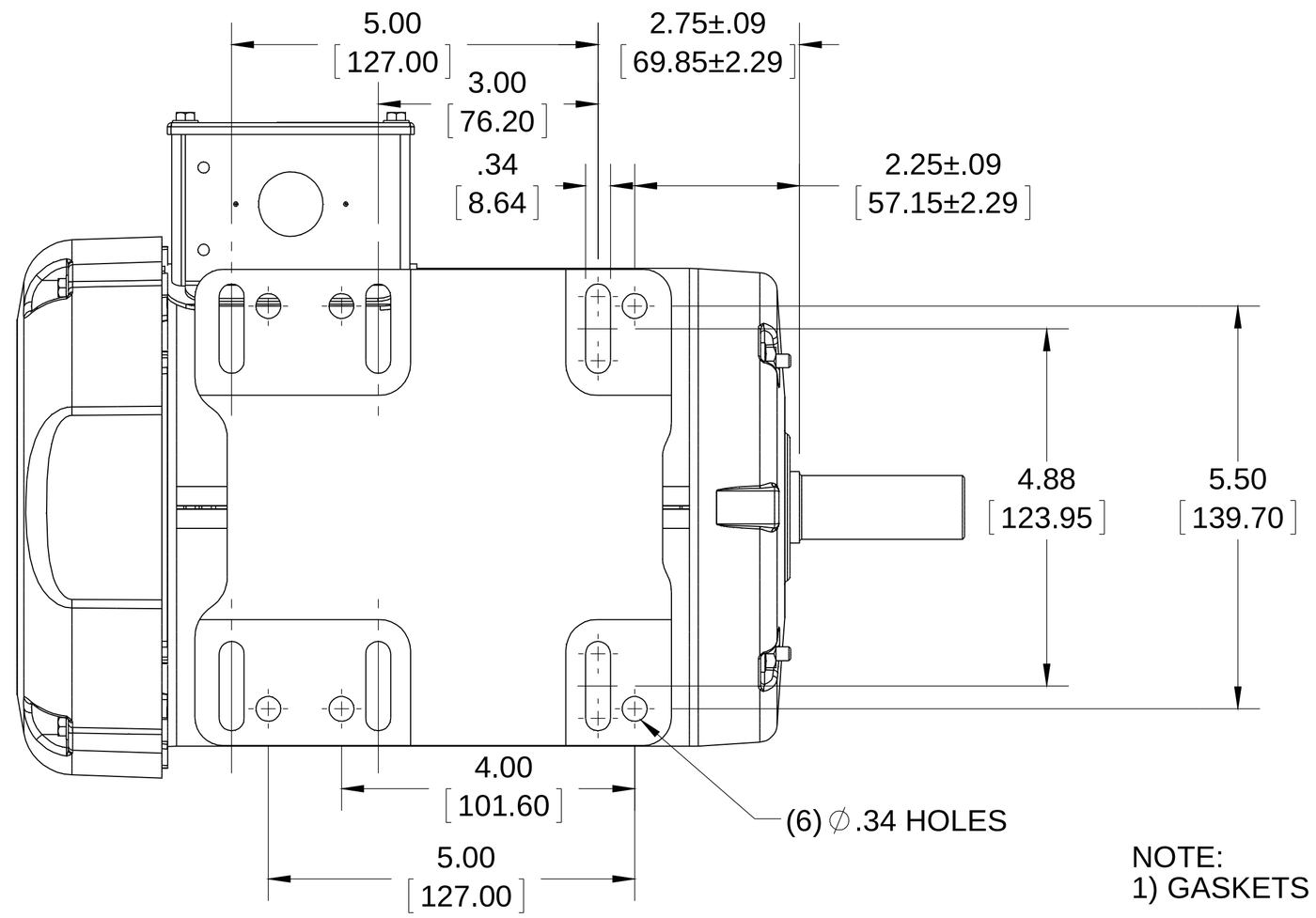
Technical Specifications

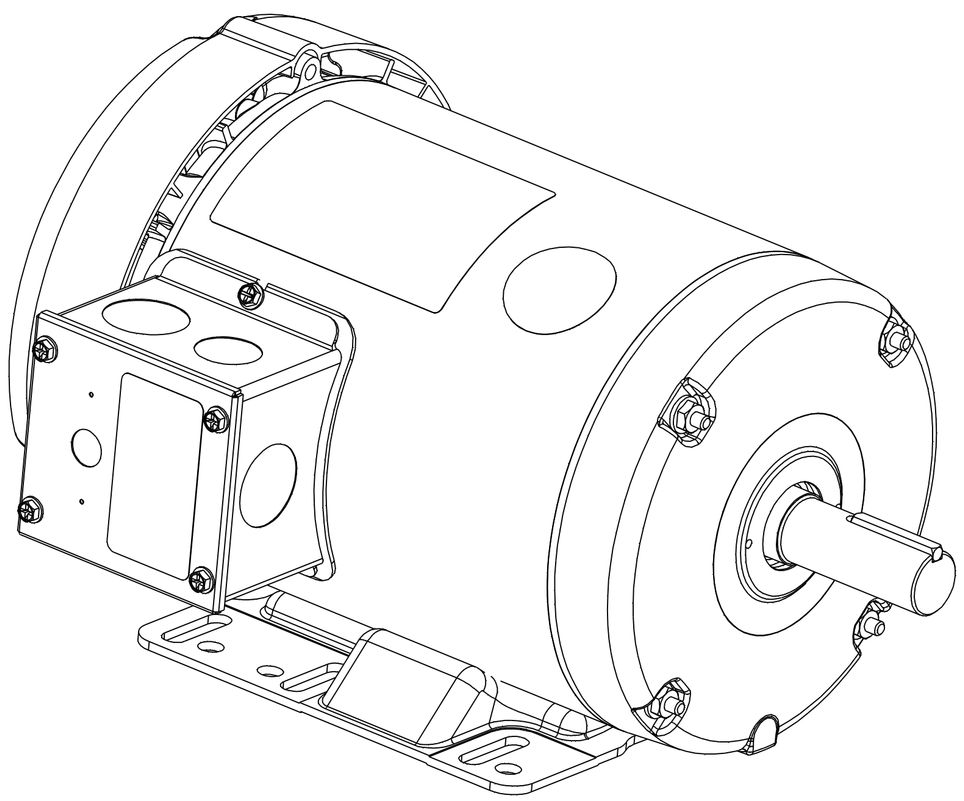
Electrical Type	**Squirrel Cage Induction Run**	Starting Method	**Across The Line**
Poles	**4**	Rotation	**Reversible**
Resistance Main	**6 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Rolled Steel**
Shaft Type	**T**	Overall Length	**13.93 in**
Frame Length	**8.00 in**	Shaft Diameter	**0.875 in**
Shaft Extension	**2.25 in**	Assembly/Box Mounting	**F1 ONLY**
Outline Drawing	**028765-800**	Connection Drawing	**005010.01LN**











NOTE:
1) GASKETS THROUGHOUT

DASH NO.	"C"	"AD 1"	"AD 2"
		ORACLE REV	10
600	11.93	3.69	3.19
650	12.43	4.19	3.69
675	12.68	4.44	3.94
700	12.93	4.69	4.19
725	13.18	4.94	4.44
750	13.43	5.19	4.69
800	13.93	5.69	5.19
850	14.43	6.19	5.69

DRAWING REVISION	REVISION BY	DATE
H	LST	4/10/15
ECO	APPROVED BY	DATE
ECO-0075607	SK	8/17/2014
ECO DESCRIPTION		
UPDATE DASH TABLE		

TOLERANCES UNLESS OTHERWISE SPECIFIED:

DEC.	INCH	mm	ANGLE
.X	±0.1	[±2.5]	±0.5°
.XX	±0.03	[±0.76]	
XXX	±0.005	[±0.127]	
.XXXX	±0.0005	[±0.0127]	

REMOVE BURRS & BREAK SHARP EDGES: .003/.015 [.076/.381]
CORNER FILLETS: .02 [.51]
MACHINED SURFACES: 125 INCH / 3.2 mm
mm SHOWN IN [BRACKETS]

DRAWN BY	JJK
DATE	06/13/07
APPROVED BY	
DATE	
REFERENCE	034941
THIRD ANGLE PROJECTION	

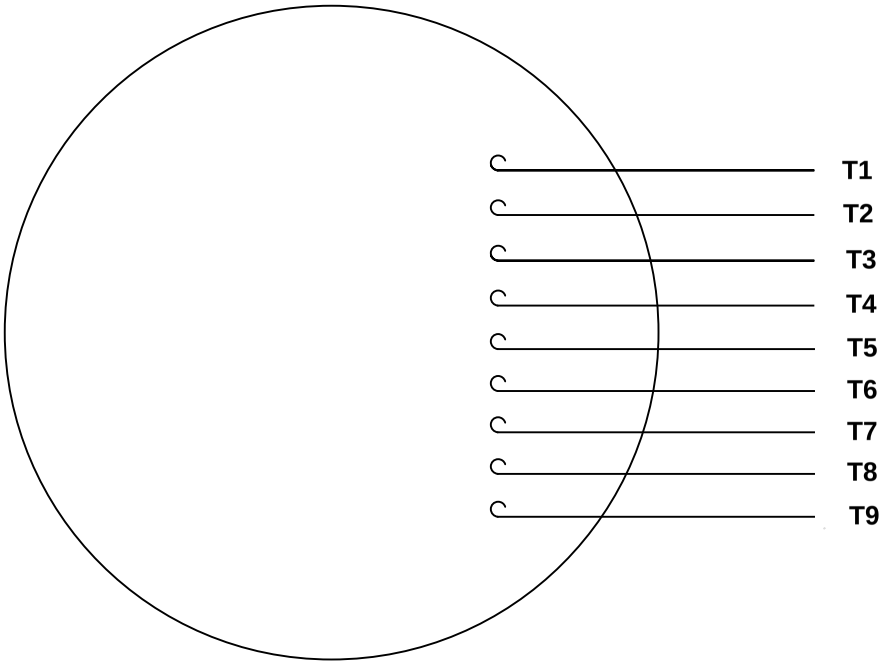
Regal Beloit America, Inc.

DESCRIPTION
OUTLINE
140T/56HZ FRAME TEFC - RIGID

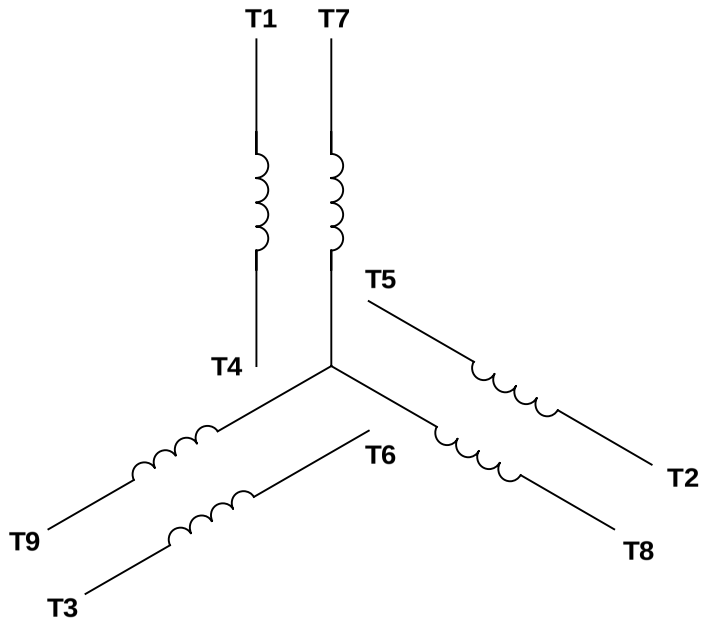
MATERIAL	PROCESS/FINISH
	GENERAL PURPOSE

SIZE	DRAWING NUMBER	SHEET
B	028765	1 OF 1

VIEW FROM OUTSIDE OF MOTOR AT SWITCH END.



LINE LEADS



VOLTAGE	L1	L2	L3	JOIN & INSULATE
HIGH	T1	T2	T3	(T4,T7) (T5,T8) (T6,T9)
LOW	T1,T7	T2,T8	T3,T9	T4,T5,T6

NO	REVISION	BY & DATE	CHK
--	REDRAWN IN SOLIDWORKS	VJB 02/08/11	

TOLERANCES UNLESS SPECIFIED
DEC INCHES
.X ±.1
.XX ±.01
.XXX ±.005
.XXXX ±.0005
ANG ±1/2°

THIRD ANGLE PROJECTION

Lincoln MOTORS

TITLE EXTERNAL WIRING DIAGRAM
3 PHASE W/O PROTECTOR

MAT'L DECAL - 004014
FINISH
RFP 04/12/02
NETWORK FILE NAME 00501001LN
PREV

DRAWN KMM 04/16/02
CHK
APPR
SCALE 1:1
REF FIG. 2-51
FMF
PAGE OF

SIZE A
DRAWING NO 005010-01LN
REV --

Data Sheet

Date: 2/1/2018

LEESON

LM33125

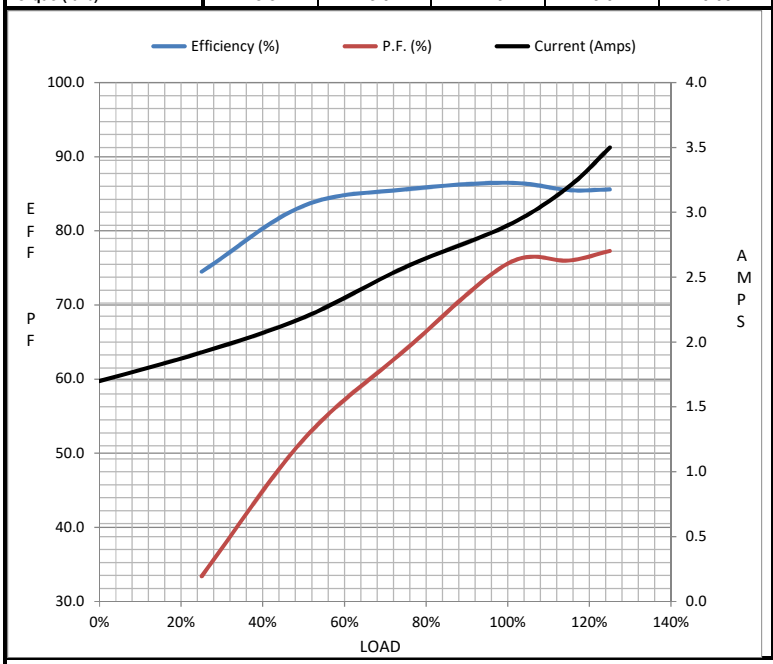
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	1.70	1.92	2.19	2.58	2.90	3.2	3.5	26.5	
Torque (ft-lb)	0.00	1.50	3.0	4.5	6.0	6.5	7.5	18.8	
RPM	1800	1787	1774	1763	1751	1,730	1732	0	
Efficiency (%)		74.5	83.4	85.6	86.5	85.5	85.6		
P.F. (%)	7.1	33.4	51.9	64.0	75.6	76.0	77.3	42.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	775	1085	1751	1800
Current (Amps)	26.5	24.4	14.2	2.90	1.70
Torque (ft-lb)	18.8	15.0	24.6	6.0	0.00



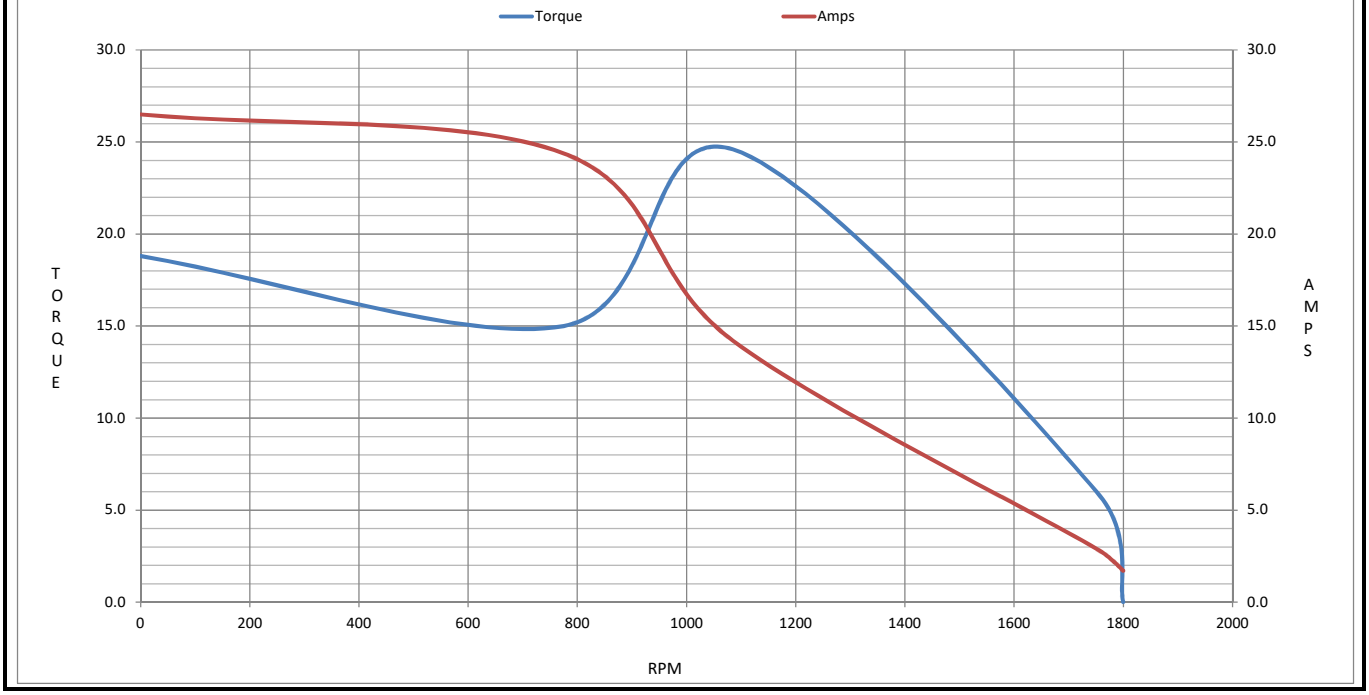
Information Block

HP	2.0
Sync. RPM	1800
Frame	140
Enclosure	TEFC
Construction	TFR
Voltage	230/460#190-208/380-415 V
Frequency	60 Hz
Design	A
LR Code letter	L
Service Factor	1.15
Temp Rise @ FL	53 °C
Duty	CONT
Ambient	40 °C
Elevation	1,000 feet
Rotor/Shaft wk²	0.16 Lb-Ft²
Ref Wdg	T634340 FR
Sound Pressure @ 1M	65 dBA
VFD Rating	NONE
Outline Dwg	028765-800
Conn. Diag	005010.01LN
Additional Specifications:	
0	
0	

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0000	0.0000	0.0000	0.0000	0.0000

Speed -Torque Curve



PRODUCT INFORMATION PACKET

Model No: 182TTFCD6026
Catalog No: GT1010A
3 HP General Purpose Motor, 3 phase, 1800 RPM, 208-230/460 V, 182T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

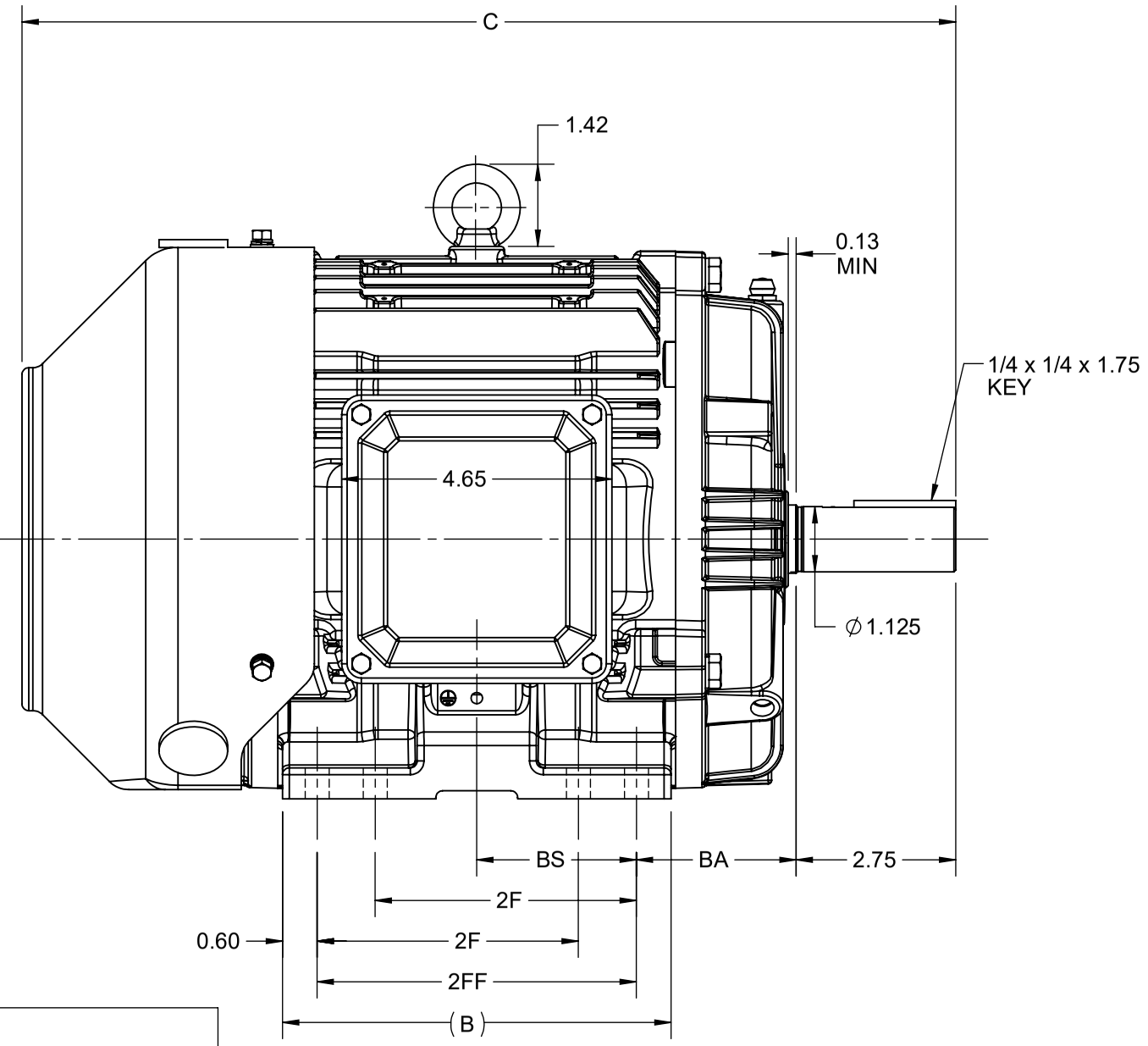
Nameplate Specifications

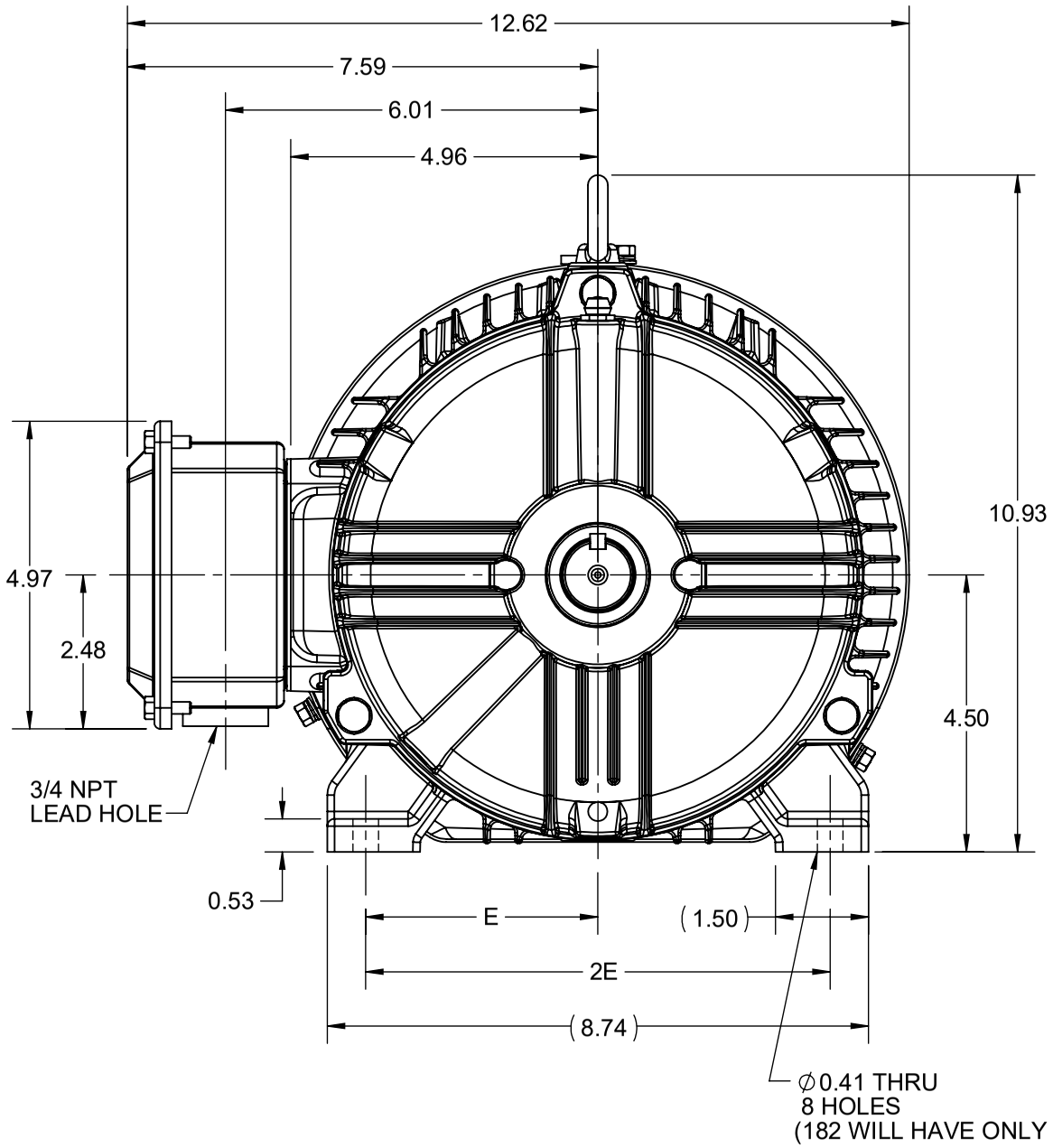
Output HP	3 Hp	Output KW	2.2 kW
Frequency	60 Hz	Voltage	208-230/460 V
Current	8.6-8.3/4.2 A	Speed	1770 rpm
Service Factor	1.15	Phase	3
Efficiency	89.5 %	Power Factor	76
Duty	Continuous	Insulation Class	F
Design Code	A	KVA Code	L
Frame	182T	Enclosure	Totally Enclosed Fan Cooled
Thermal Protection	No	Ambient Temperature	40 °C
Drive End Bearing Size	6206	Opp Drive End Bearing Size	6205
UL	Listed	CSA	Y
CE	Y	IP Code	55
Hazardous Location	DIVISION 2 T2B		

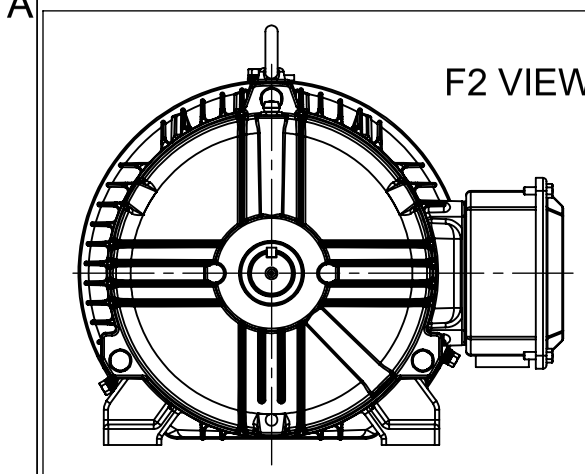
Technical Specifications

Electrical Type	Squirrel Cage Inverter Rated	Starting Method	Line Or Inverter
Poles	4	Rotation	Selective Clockwise
Resistance Main	3.85 Ohms	Mounting	Rigid Base
Motor Orientation	Horizontal	Drive End Bearing	Ball
Opp Drive End Bearing	Ball	Frame Material	Cast Iron
Shaft Type	T	Overall Length	15.08 in
Frame Length	5.85 in	Shaft Diameter	1.125 in
Shaft Extension	2.75 in	Assembly/Box Mounting	F1/F2 CAPABLE
Connection Drawing	EE7308	Outline Drawing	SS620855-100

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	5.67	15.08	3.75	7.50	-	4.50	2.75	2.35	F1 OR F2	182T
200	6.69	16.08			4.50	5.50		2.75		182/184T







DRAWING REVISION	REVISION BY	REV DATE/© DATE
B	BISWA	12/02/2021
ECO	APPROVED BY	DATE
CR-0001146	GNK	12/02/2021
ECO DESCRIPTION		
DRAWING UPDATED		

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

DRAWN BY	WZ
DATE	08/11/2017
APPROVED BY	WY
DATE	08/11/2017
REFERENCE	

THIRD ANGLE PROJECTION

REGAL® Regal Beloit America, Inc.

DESCRIPTION
OUTLINE
182/184T FR-NEMA TEFC CAST IRON

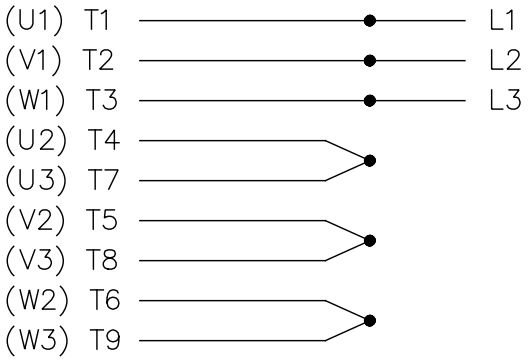
MATERIAL | PROCESS/FINISH

SIZE	DRAWING NUMBER	SHEET
B	SS620855	1 OF 1

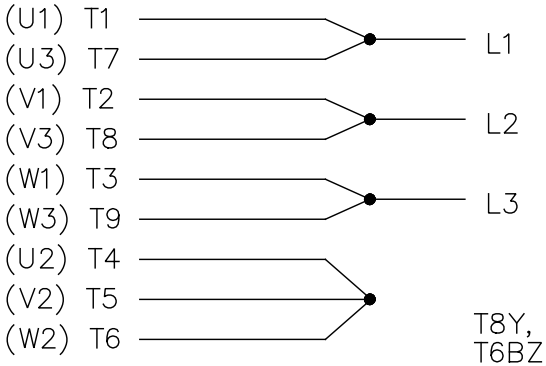
EE7308

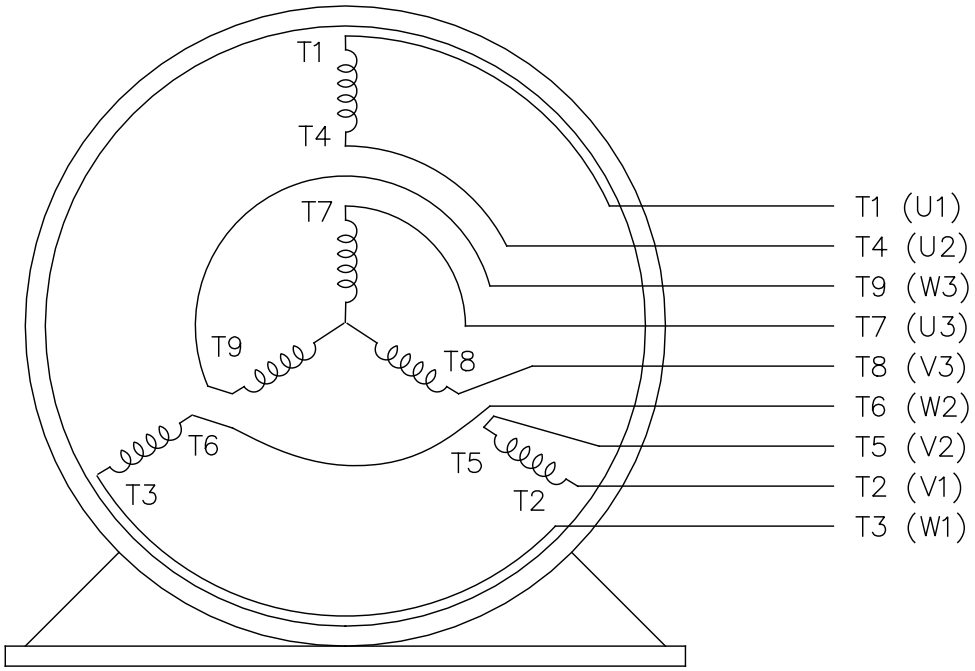
THREE PHASE DUAL VOLTAGE MOTOR

HIGH VOLTAGE



LOW VOLTAGE





VIEW OF TERMINAL END

REF.
WINDING DIAGRAM

T8Y, T2Y, T2BL, T4BX, T2EC, T2G
T6BZ, T2B, T6BL, T4AV, T6B, T4B

OPTIONAL CORD CONNECTION

L1	WHITE
L2	RED
L3	BLACK

NO.	REVISION	BY & DATE	CHK
5	CHG TO REGAL LOGO	SL 09/10/2015	AB
4	REVISED IEC NOTATIONS	MSG 11/15/2011	CMN
3	ADDED IEC NOTATIONS... (U1), (V1) ETC. MU95194	MSG 5/10/2010	MJS
2	ADDED THE OPTIONAL CORD CONNECTION MU46318	RDH 04/24/2003	DRS
1	REDRAWN	RM 11/20/1990	

TOLERANCES UNLESS SPECIFIED

ANG	DEC.	INCHES
	.X	±.1
	.XX	±.02
	.XXX	±.005
	.XXXX	±.0005
ANG		±7'30"

REGAL™ Regal Beloit America, Inc.

TITLE CONNECTION DIAGRAM
3ø – DUAL VOLTAGE MOTOR

MAT'L.

FINISH

CAD FILE ee7308

RFP

DIST WP

DRAWN RM	11/20/1990
CHK ML	11/21/1990
APPD SAS	04/24/2003
SCALE	1=1
REF	
FMF	
PREV	

SIZE	DRAWING NO. PAGE OF	REV.
A	EE7308	5

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 182TTFCD6026 BB

CONN. DIAGRAM: EE7308

CUSTOMER PART #:

OUTLINE: SS620855-182T

MOUNTING: F1/F2 CAPABLE

WINDING #: HE31124021 3

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
3&2	2.24&1.49	1800	1762&1468	182T	TEFC	K	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	8/4&6.8/3.4	LINE OR INVERTER	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	89.5&85.5	3/4 LOAD EFF:	88.5	1/2 LOAD EFF:	86.5	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	78&75	3/4 LOAD PF:	70	1/2 LOAD PF:	57	88.5	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
9 LB-FT	64 / 32	20 LB-FT 220 %	29 LB-FT 320 %	60

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
50 dBA	60 dBA	- LB-FT^2	- LB-FT^2	15 SEC.	2	97 LBS.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6206	6205						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

*****

N

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T

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S

*****

INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:50:05 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 7/16/2020
Customer:
Attention:
Submitted by:

182TTFCD6026

Submittal

Data @ 460 **V**

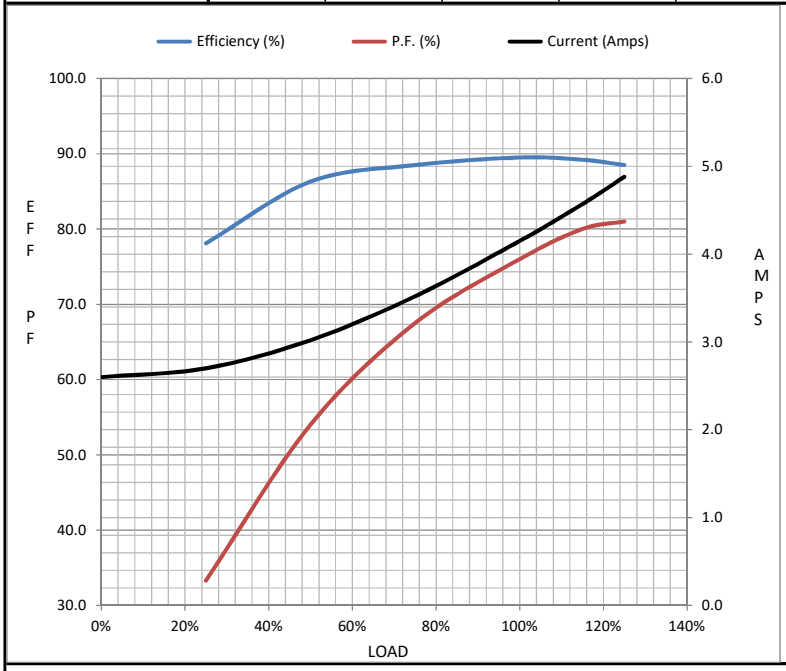
marathon® Motors

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	2.60	2.70	3.0	3.5	4.2	4.6	4.9	37.0	
Torque (ft-lb)	0.00	2.20	4.4	6.7	9.0	10.3	11.2	23.0	
RPM	1800	1792	1785	1778	1770	1,766	1762	0	
Efficiency (%)		78.1	86.3	88.5	89.5	89.2	88.5		
P.F. (%)	7.3	33.3	54.0	67.5	76.0	80.0	81.0	50.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1526	1770	1800
Current (Amps)	37.0	30.0	20.5	4.2	2.60
Torque (ft-lb)	23.0	19.5	33.5	9.0	0.00

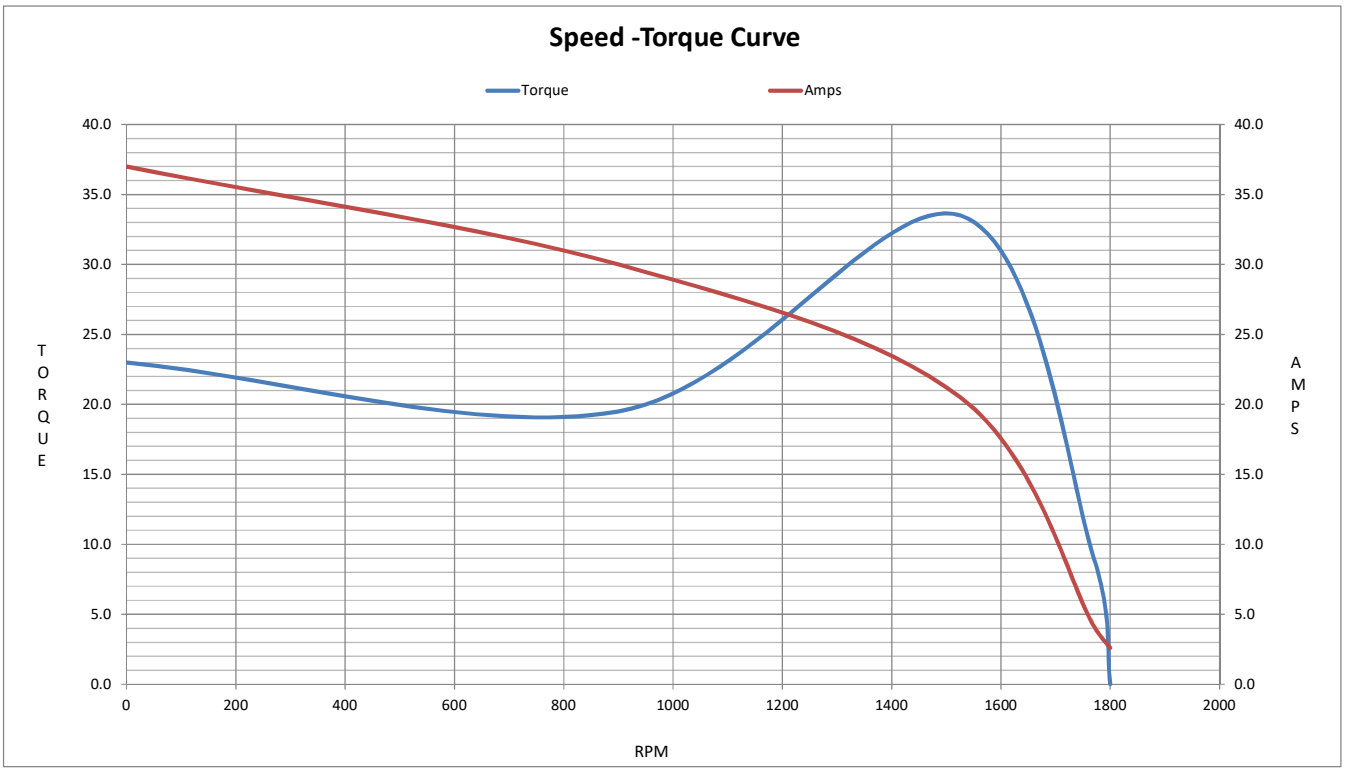


Information Block

HP	3.0
Sync. RPM	1800
Frame	182
Enclosure	TEFC
Construction	TFC
Voltage	208-230/460#190/380 V
Frequency	60 Hz
Design	A
LR Code letter	L
Service Factor	1.15
Temp Rise @ FL	55 ° C
Duty	CONT
Ambient	40 ° C
Elevation	3,300 feet
Rotor/Shaft wk²	0.00 Lb-Ft²
Ref Wdg	HA31124026 R1
Sound Pressure @ 1M	62 dBA
VFD Rating	CONSTANT 10:1/VARIABLE 10:1
Outline Dwg	037898-912
Conn. Diag	EE7308
Additional Specifications:	
0	
0	

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
2.1840	1.2480	4.9350	4.9160	103.3320



PRODUCT INFORMATION PACKET

Model No: 184TTFCD6026
Catalog No: GT1013A
5 HP General Purpose Motor, 3 phase, 1800 RPM, 230/460 V, 184T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

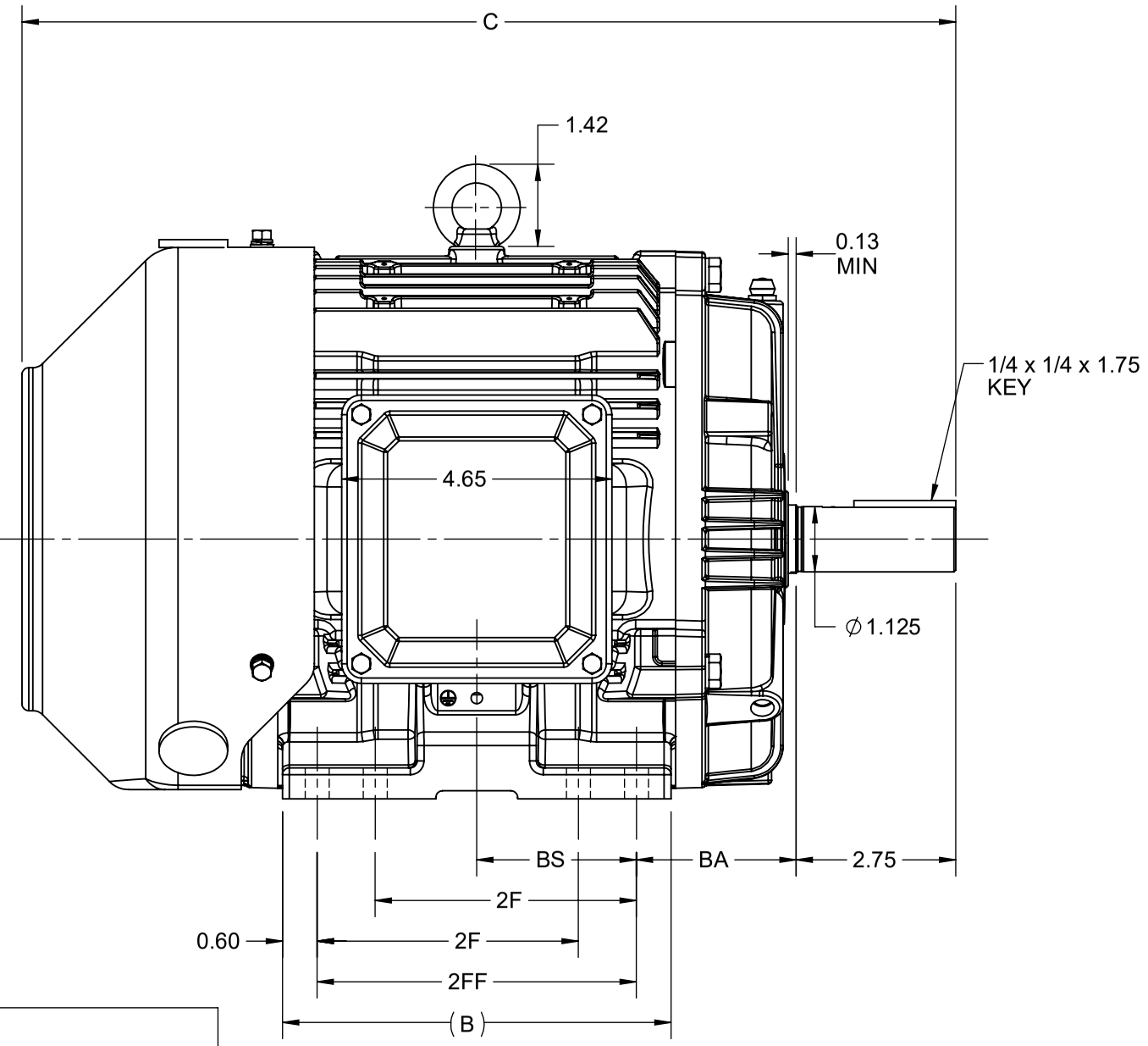
Nameplate Specifications

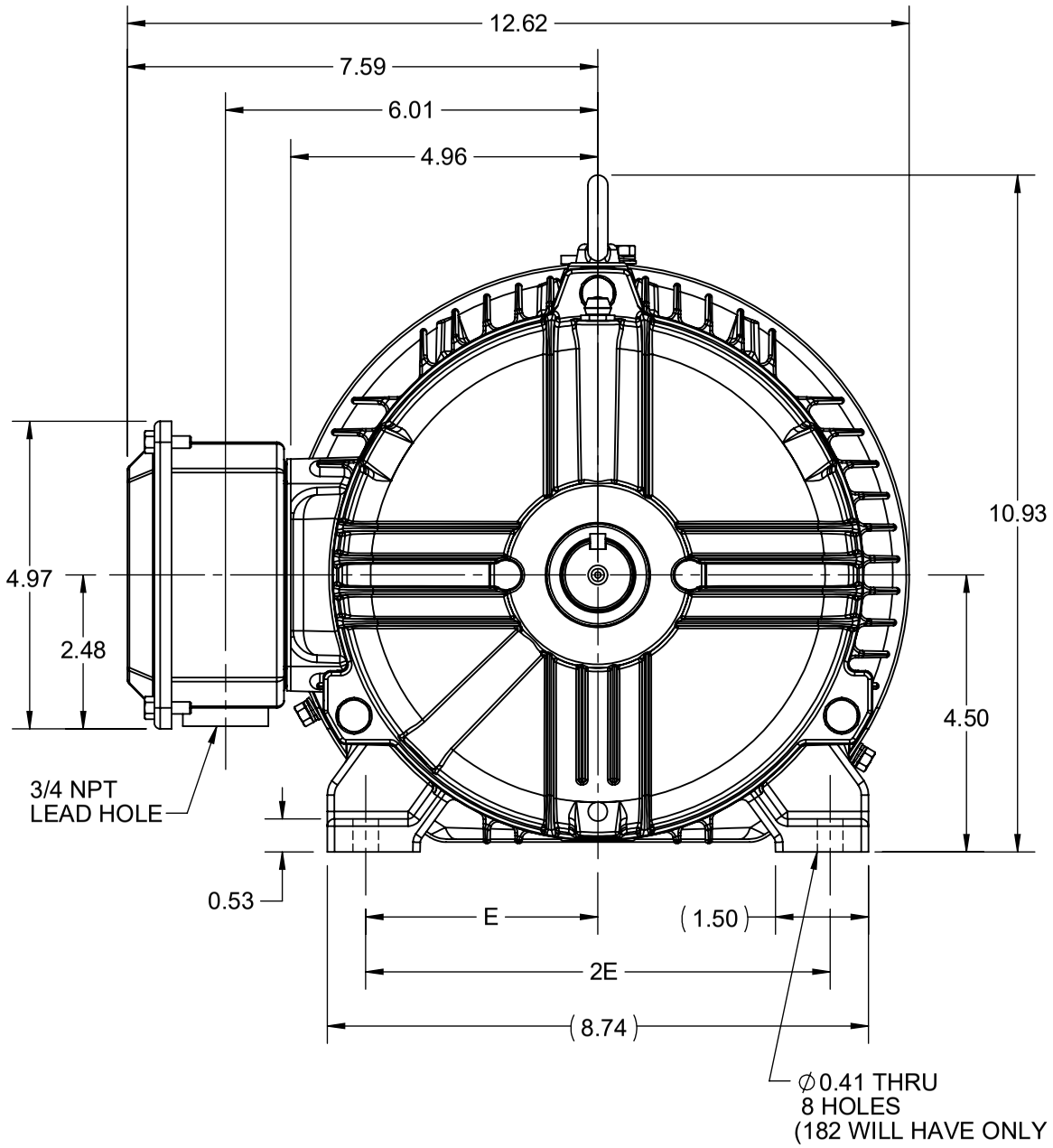
Output HP	**5 Hp**	Output KW	**3.7 kW**
Frequency	**60 Hz**	Voltage	**230/460 V**
Current	**13.2/6.6 A**	Speed	**1765 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**89.5 %**	Power Factor	**80**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**A**	KVA Code	**K**
Frame	**184T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6206**	Opp Drive End Bearing Size	**6205**
UL	**Listed**	CSA	**Y**
CE	**Y**	IP Code	**55**
Hazardous Location	**DIVISION 2 T2B**		

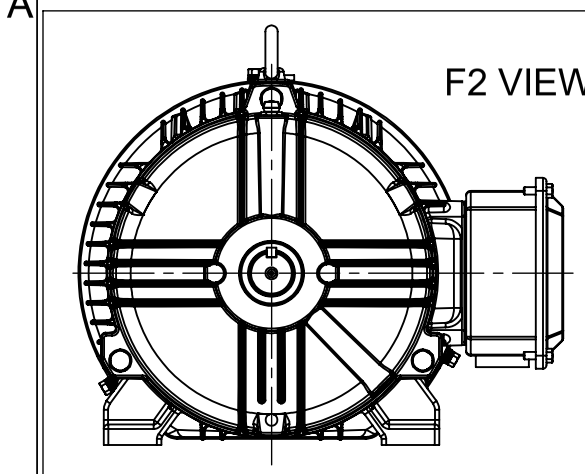
Technical Specifications

Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Line Or Inverter**
Poles	**4**	Rotation	**Selective Clockwise**
Resistance Main	**2.75 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Cast Iron**
Shaft Type	**T**	Overall Length	**16.08 in**
Frame Length	**6.85 in**	Shaft Diameter	**1.125 in**
Shaft Extension	**2.75 in**	Assembly/Box Mounting	**F1/F2 CAPABLE**
Outline Drawing	**SS620855-200**	Connection Drawing	**EE7308**

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	5.67	15.08	3.75	7.50	-	4.50	2.75	2.35	F1 OR F2	182T
200	6.69	16.08			4.50	5.50		2.75		182/184T







DRAWING REVISION	REVISION BY	REV DATE/© DATE
B	BISWA	12/02/2021
ECO	APPROVED BY	DATE
CR-0001146	GNK	12/02/2021
ECO DESCRIPTION		
DRAWING UPDATED		

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

DRAWN BY	WZ
DATE	08/11/2017
APPROVED BY	WY
DATE	08/11/2017
REFERENCE	

Regal Beloit America, Inc.

DESCRIPTION
OUTLINE
182/184T FR-NEMA TEFC CAST IRON

MATERIAL | PROCESS/FINISH

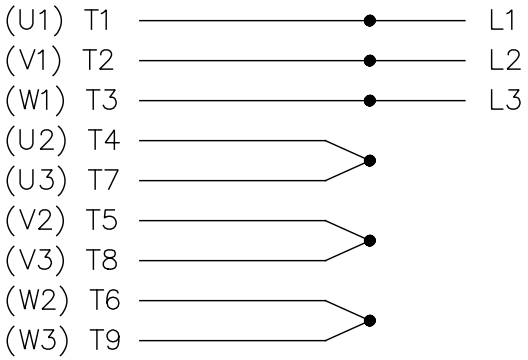
THIRD ANGLE PROJECTION

SIZE	DRAWING NUMBER	SHEET
B	SS620855	1 OF 1

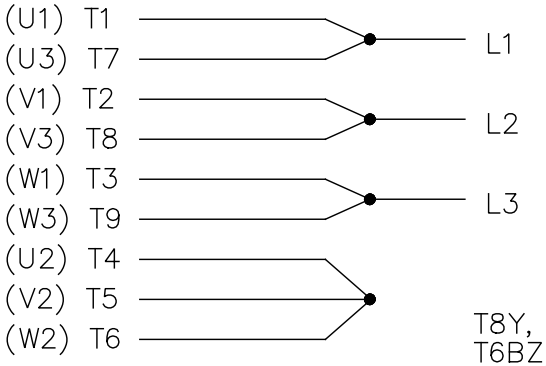
EE7308

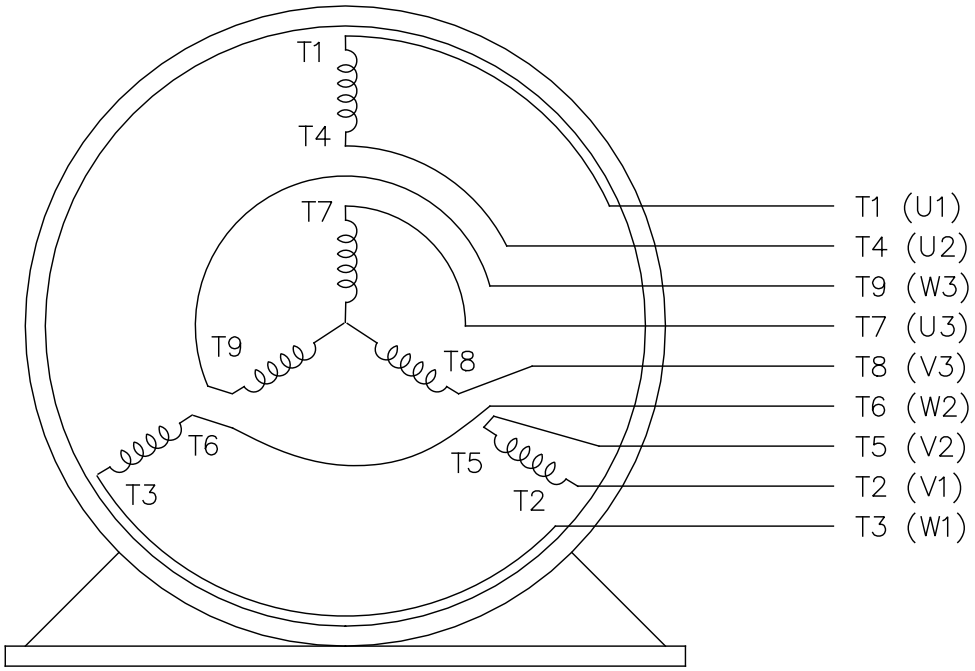
THREE PHASE DUAL VOLTAGE MOTOR

HIGH VOLTAGE



LOW VOLTAGE





VIEW OF TERMINAL END

REF.
WINDING DIAGRAM

T8Y, T2Y, T2BL, T4BX, T2EC, T2G
T6BZ, T2B, T6BL, T4AV, T6B, T4B

OPTIONAL CORD CONNECTION

L1	WHITE
L2	RED
L3	BLACK

NO.	REVISION	BY & DATE	CHK
5	CHG TO REGAL LOGO	SL 09/10/2015	AB
4	REVISED IEC NOTATIONS	MSG 11/15/2011	CMN
3	ADDED IEC NOTATIONS... (U1), (V1) ETC. MU95194	MSG 5/10/2010	MJS
2	ADDED THE OPTIONAL CORD CONNECTION MU46318	RDH 04/24/2003	DRS
1	REDRAWN	RM 11/20/1990	

TOLERANCES UNLESS SPECIFIED

ANG	DEC.	INCHES
	.X	±.1
	.XX	±.02
	.XXX	±.005
	.XXXX	±.0005
ANG		±7'30"

REGAL™ Regal Beloit America, Inc.

TITLE CONNECTION DIAGRAM
3ø – DUAL VOLTAGE MOTOR

MAT'L.

FINISH

CAD FILE ee7308

RFP

DIST WP

DRAWN RM	11/20/1990
CHK ML	11/21/1990
APPD SAS	04/24/2003
SCALE	1=1
REF	
FMF	
PREV	

SIZE	DRAWING NO. PAGE OF	REV.
A	EE7308	5

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 184TTFCD6026 BB

CONN. DIAGRAM: EE7308

CUSTOMER PART #:

OUTLINE: SS620855-184T

MOUNTING: F1/F2 CAPABLE

WINDING #: HE31124020 3

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
5&3	3.70&2.24	1800	1755&1462	184T	TEFC	J	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	13/6.5&10.2/5.1	LINE OR INVERTER	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	89.5&86.5	3/4 LOAD EFF:	89.5	1/2 LOAD EFF:	88.5	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	80&77	3/4 LOAD PF:	75	1/2 LOAD PF:	64	88.5	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
15 LB-FT	99 / 49.5	33 LB-FT 220 %	42 LB-FT 290 %	60

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
50 dBA	60 dBA	- LB-FT^2	- LB-FT^2	15 SEC.	2	111 LBS.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6206	6205						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

NOTES

INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:48:24 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

MARATHON ELECTRIC CORPORATION

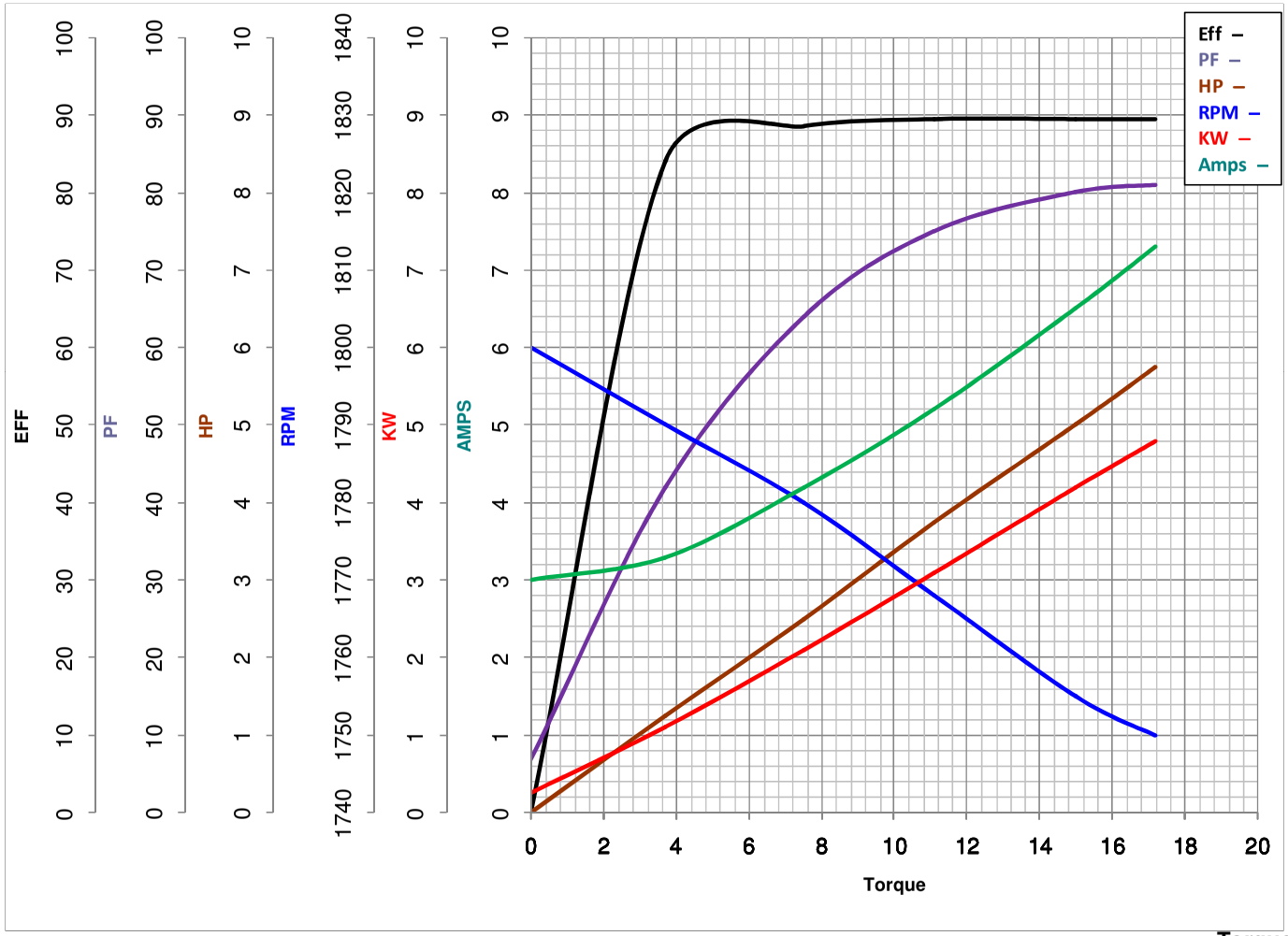
TYPICAL PERFORMANCE CURVE for AC MOTOR

Customer

Curve at 460 **Volts** **HP** 5&3 **PHASE** 3
60 **HZ**
5 **HP**

Model No 184TTFCD6026 **VOLTS** 230/460&190/380

Catalog No GT1013A **HZ** 60&50 **RPM** 1755&1462



Torque in Lb.Ft

FL TORQUE	15	Lb.Ft	**FL AMPS**	13/6.5	
BD TORQUE	42.0	Lb.Ft	**PU TORQUE**	27.0	Lb.Ft
LR TORQUE	33	Lb.Ft	**LR AMPS**	49.5	
WINDING	HE31124020-3	**Prepared By**	ANUSHA M	**Date**	5/4/2018

PRODUCT INFORMATION PACKET

Model No: 213TTFCD6026
Catalog No: GT1016A
7.50 HP General Purpose Motor, 3 phase, 1800 RPM, 208-230/460 V, 213T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

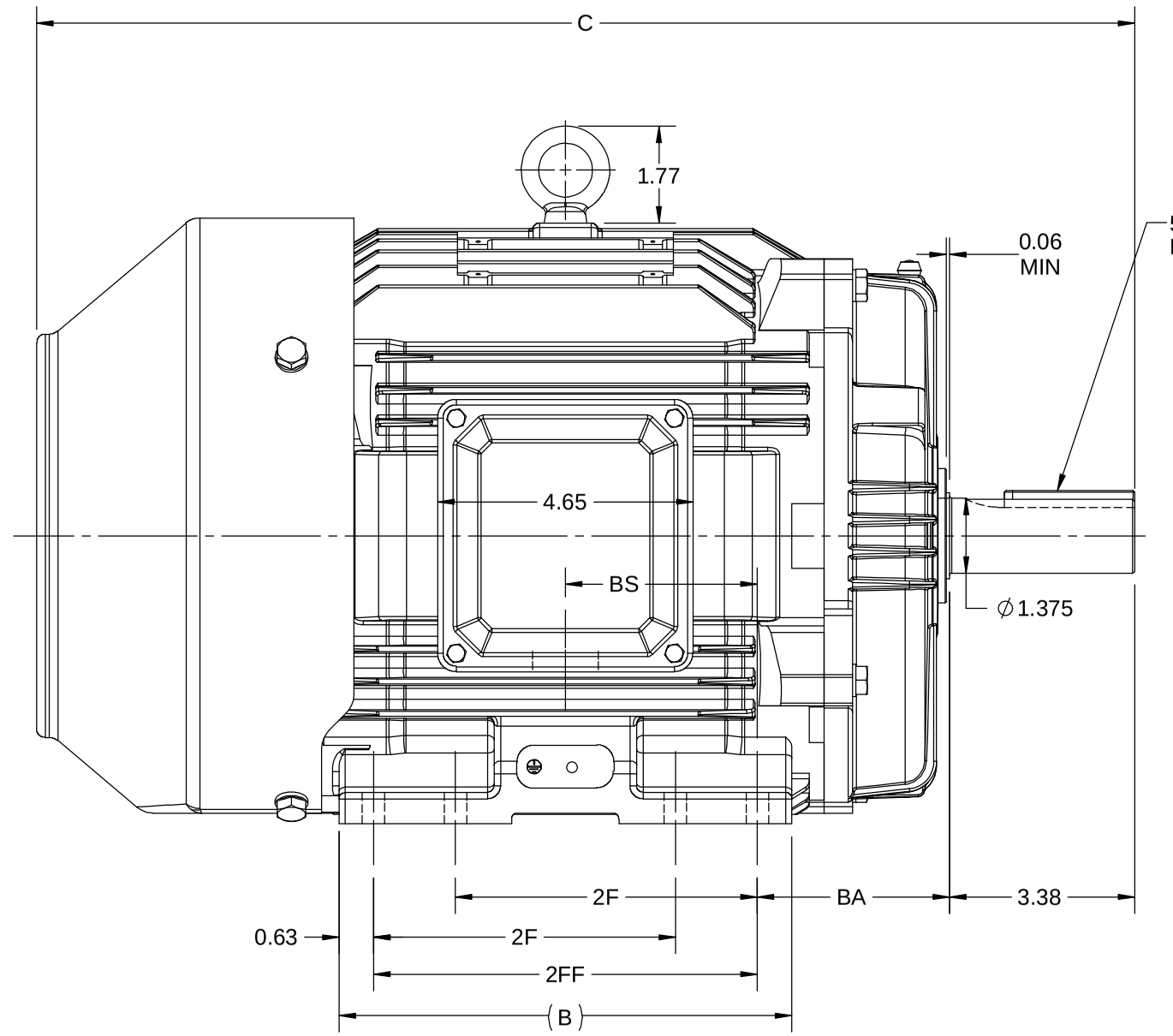
Nameplate Specifications

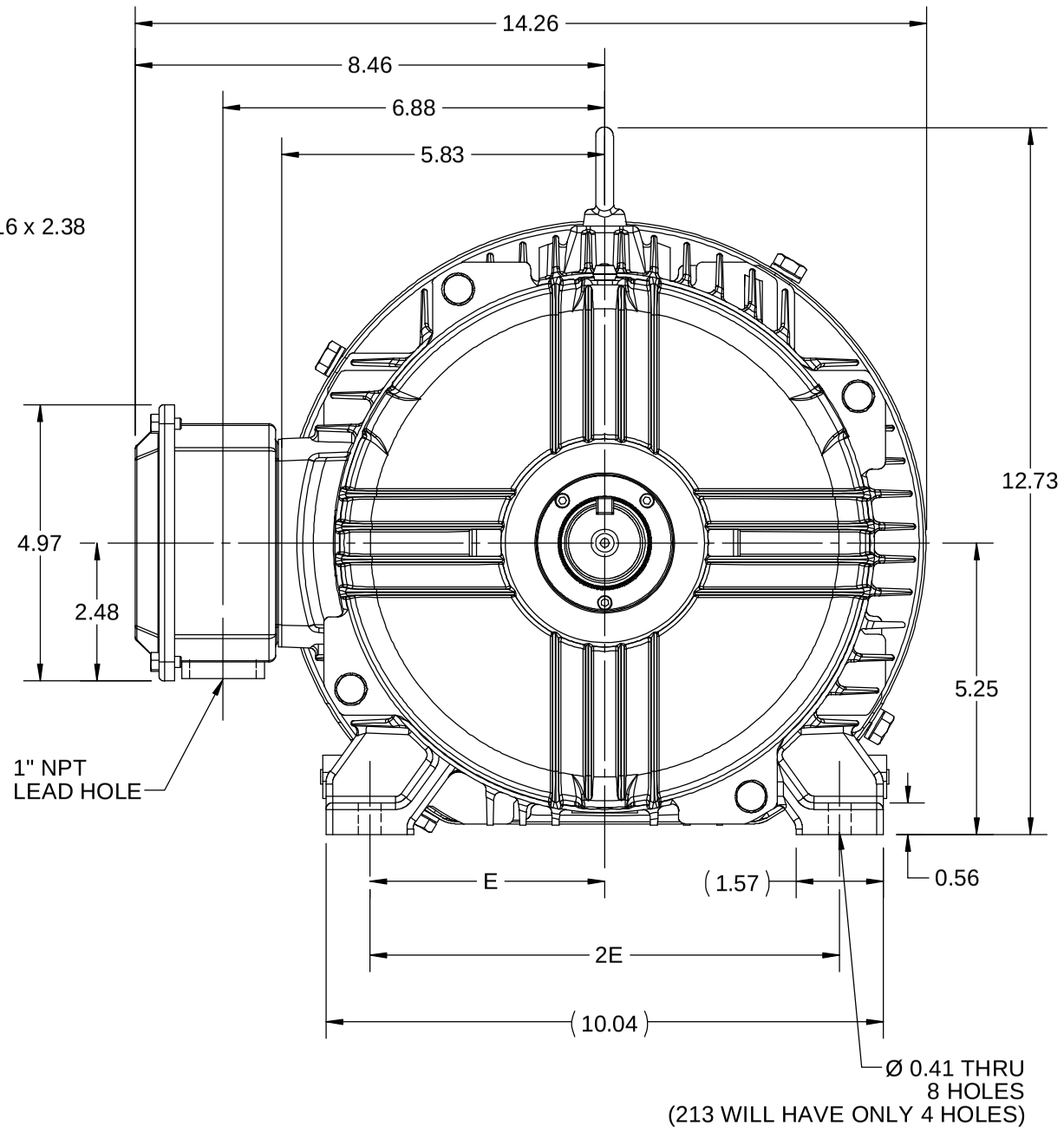
Output HP	**7.50 Hp**	Output KW	**5.6 kW**
Frequency	**60 Hz**	Voltage	**208-230/460 V**
Current	**20.6-19.0/9.5 A**	Speed	**1768 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**91.7 %**	Power Factor	**79.3**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**H**
Frame	**213T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6308**	Opp Drive End Bearing Size	**6208**
UL	**Listed**	CSA	**Y**
CE	**Y**	IP Code	**55**
Hazardous Location	**DIVISION 2 T2B**		

Technical Specifications

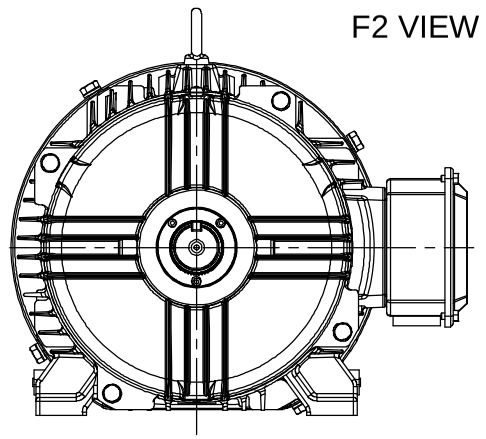
Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Line Or Inverter**
Poles	**4**	Rotation	**Selective Clockwise**
Resistance Main	**1.473 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Cast Iron**
Shaft Type	**T**	Overall Length	**18.53 in**
Shaft Diameter	**1.375 in**	Shaft Extension	**3.38 in**
Assembly/Box Mounting	**F1/F2 CAPABLE**		
Connection Drawing	**EE7308**	Outline Drawing	**SS620702-100**

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	6.76	18.53	4.25	8.50	---	5.50	3.50	2.75	F1 OR F2	213T
200	8.26	20.03			5.50	7.00		3.50		213/215T





F2 VIEW



DRAWING REVISION	REVISION BY	REV DATE/© DATE
C	VS	30-09-2020
ECO	APPROVED BY	DATE
ECO-0194527	GNK	30-09-2020
ECO DESCRIPTION		
UPDATED DRAWING		

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

DRAWN BY	JOY
DATE	04/05/2015
APPROVED BY	SBD
DATE	04/05/2015
REFERENCE	
THIRD ANGLE PROJECTION	

REGAL® Regal Beloit America, Inc.

DESCRIPTION
OUTLINE
213/215T FR TEFC- CAST IRON

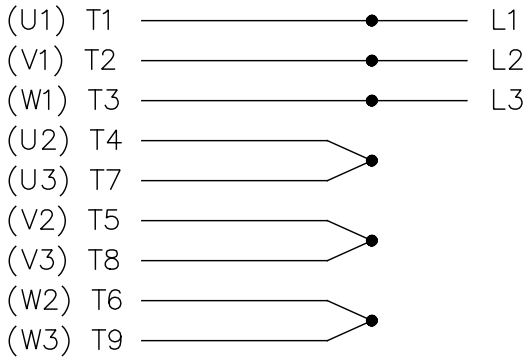
MATERIAL	PROCESS/FINISH

SIZE	DRAWING NUMBER	SHEET
B	SS620702	1 OF 1

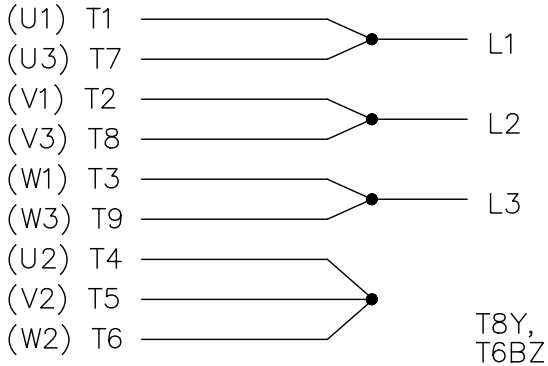
EE7308

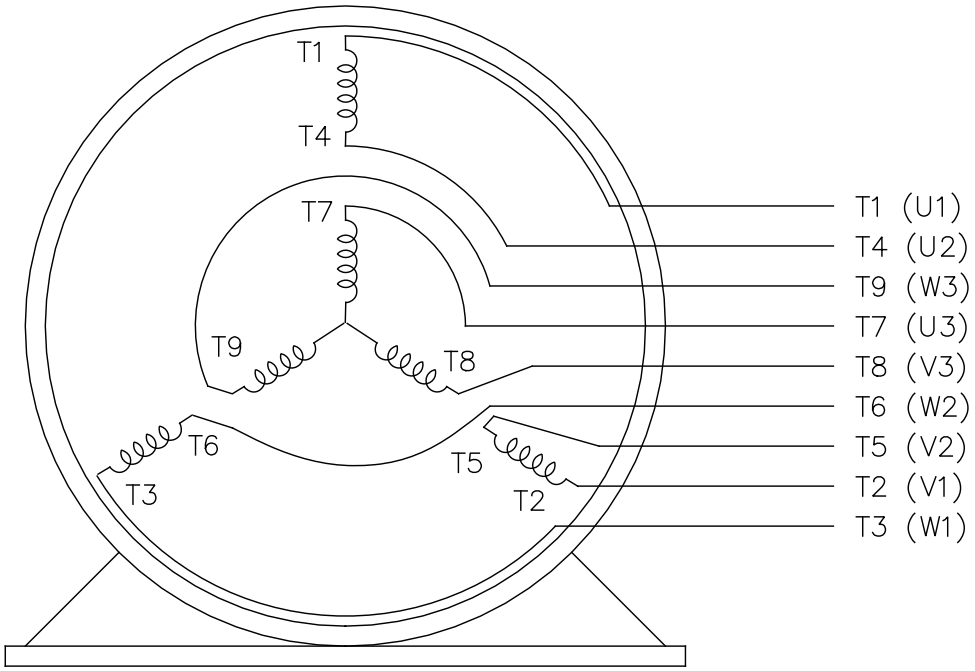
THREE PHASE DUAL VOLTAGE MOTOR

HIGH VOLTAGE



LOW VOLTAGE





VIEW OF TERMINAL END

REF.
WINDING DIAGRAM

T8Y, T2Y, T2BL, T4BX, T2EC, T2G
T6BZ, T2B, T6BL, T4AV, T6B, T4B

OPTIONAL CORD CONNECTION

L1	WHITE
L2	RED
L3	BLACK

NO.	REVISION	BY & DATE	CHK
5	CHG TO REGAL LOGO	SL 09/10/2015	AB
4	REVISED IEC NOTATIONS	MSG 11/15/2011	CMN
3	ADDED IEC NOTATIONS... (U1), (V1) ETC. MU95194	MSG 5/10/2010	MJS
2	ADDED THE OPTIONAL CORD CONNECTION MU46318	RDH 04/24/2003	DRS
1	REDRAWN	RM 11/20/1990	

TOLERANCES UNLESS SPECIFIED

ANG	DEC.	INCHES
	.X	±.1
	.XX	±.02
	.XXX	±.005
	.XXXX	±.0005
ANG		±7'30"

REGAL™ Regal Beloit America, Inc.

TITLE CONNECTION DIAGRAM
3ø – DUAL VOLTAGE MOTOR

MAT'L.

FINISH

CAD FILE ee7308

RFP

DIST WP

DRAWN RM	11/20/1990
CHK ML	11/21/1990
APPD SAS	04/24/2003
SCALE	1=1
REF	
FMF	
PREV	

SIZE	DRAWING NO. PAGE OF	REV.
A	EE7308	5

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 213TTFCD6026 BB

CONN. DIAGRAM: A-EE7308

CUSTOMER PART #:

OUTLINE: SS620702-213T

MOUNTING: F1/F2 CAPABLE

WINDING #: HE31324012 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
7 1/2&5	5.60&3.70	1800	1768&1475	213T	TEFC	H	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	19/9.5&16/8	LINE OR INVERTER	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	93.3&91	**3/4 LOAD EFF:**	91	**1/2 LOAD EFF:**	90	**GTD. EFF**	**ELEC. TYPE**
FULL LOAD PF:	79.3&76.5	**3/4 LOAD PF:**	73.4	**1/2 LOAD PF:**	63.8	91	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
22.3 **LB-FT**	124 / 62	45 **LB-FT** 202 %	59 **LB-FT** 265 %	40

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
62 **dBA**	72 **dBA**	0.95 **LB-FT^2**	75 **LB-FT^2**	25 **SEC.**	2	167 **LBS.**

***** SUPPLEMENTAL INFORMATION *****

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6308	6208						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE **VOLTS**

NOTES

INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 12:46:51 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 7/16/2020
Customer:
Attention:
Submitted by:

marathon® electric

213TTFCD6026

Submittal

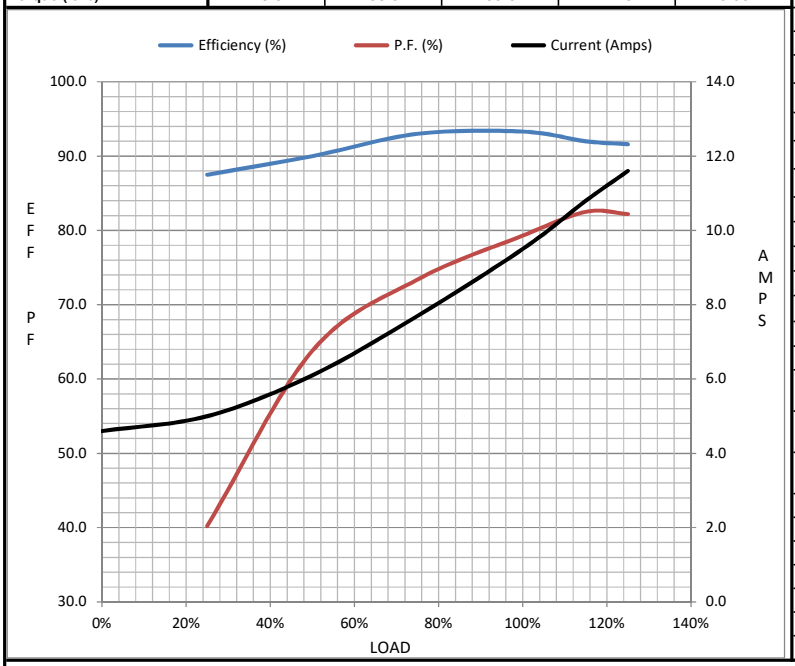
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	4.6	5.0	6.1	7.7	9.5	10.8	11.6	62.0	
Torque (ft-lb)	0.00	5.5	11.0	16.6	22.3	25.6	28.0	45.0	
RPM	1800	1792	1785	1775	1768	1,762	1758	0	
Efficiency (%)		87.5	90.0	93.0	93.3	92.0	91.6		
P.F. (%)	12.3	40.2	63.8	73.4	79.3	82.5	82.2	43.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1580	1768	1800
Current (Amps)	62.0	56.0	35.0	9.5	4.6
Torque (ft-lb)	45.0	38.0	59.0	22.3	0.00



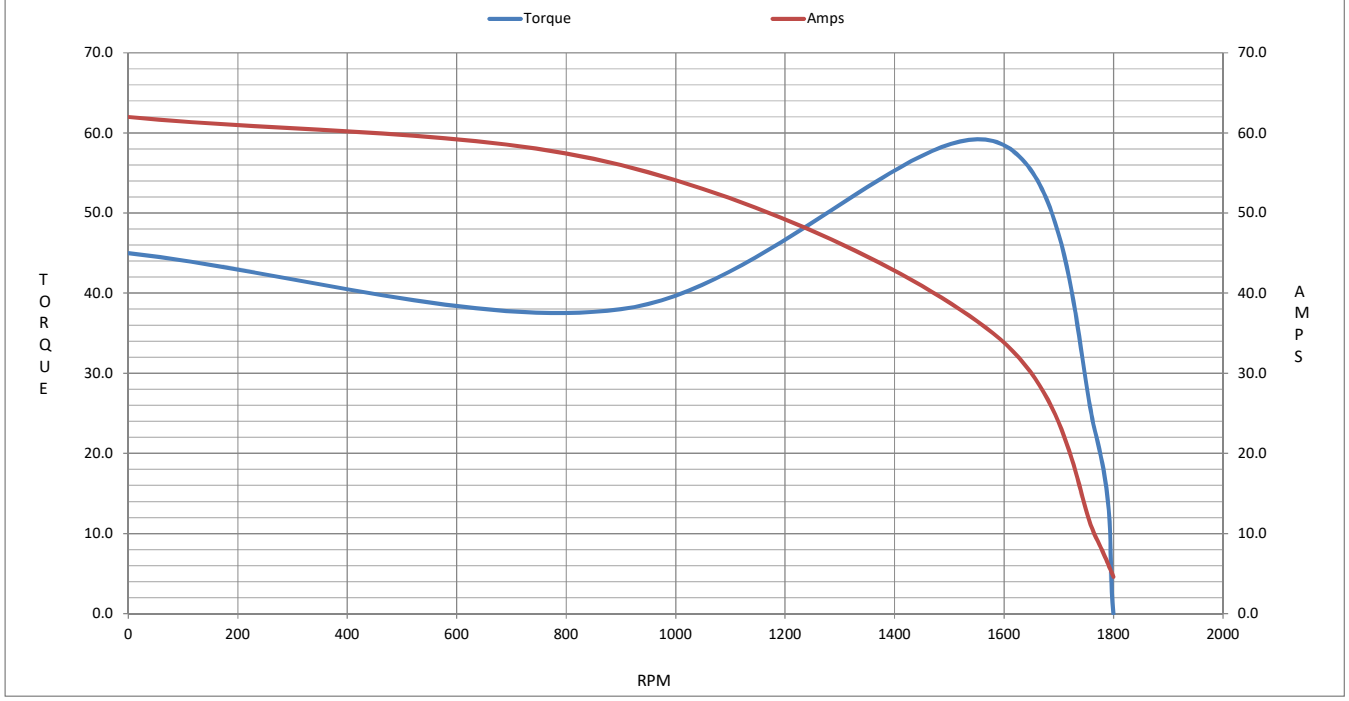
Information Block

HP	7.5
Sync. RPM	1800
Frame	213
Enclosure	TEFC
Construction	TFC
Voltage	208-230/460#190/380 V
Frequency	60 Hz
Design	B
LR Code letter	H
Service Factor	1.15
Temp Rise @ FL	40 ° C
Duty	CONT
Ambient	40 ° C
Elevation	3,300 feet
Rotor/Shaft wk²	0.95 Lb-Ft²
Ref Wdg	HA31324012 R2
Sound Pressure @ 1M	62 dBA
VFD Rating	CONSTANT 10:1/VARIABLE 10:1
Outline Dwg	037898-912
Conn. Diag	EE7308
Additional Specifications:	
0	
0	

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.9110	0.5480	2.6610	3.0810	56.8890

Speed -Torque Curve



PRODUCT INFORMATION PACKET

Model No: 215TTFCD6026
Catalog No: GT1019A
10 HP General Purpose Motor, 3 phase, 1800 RPM, 208-230/460 V, 215T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

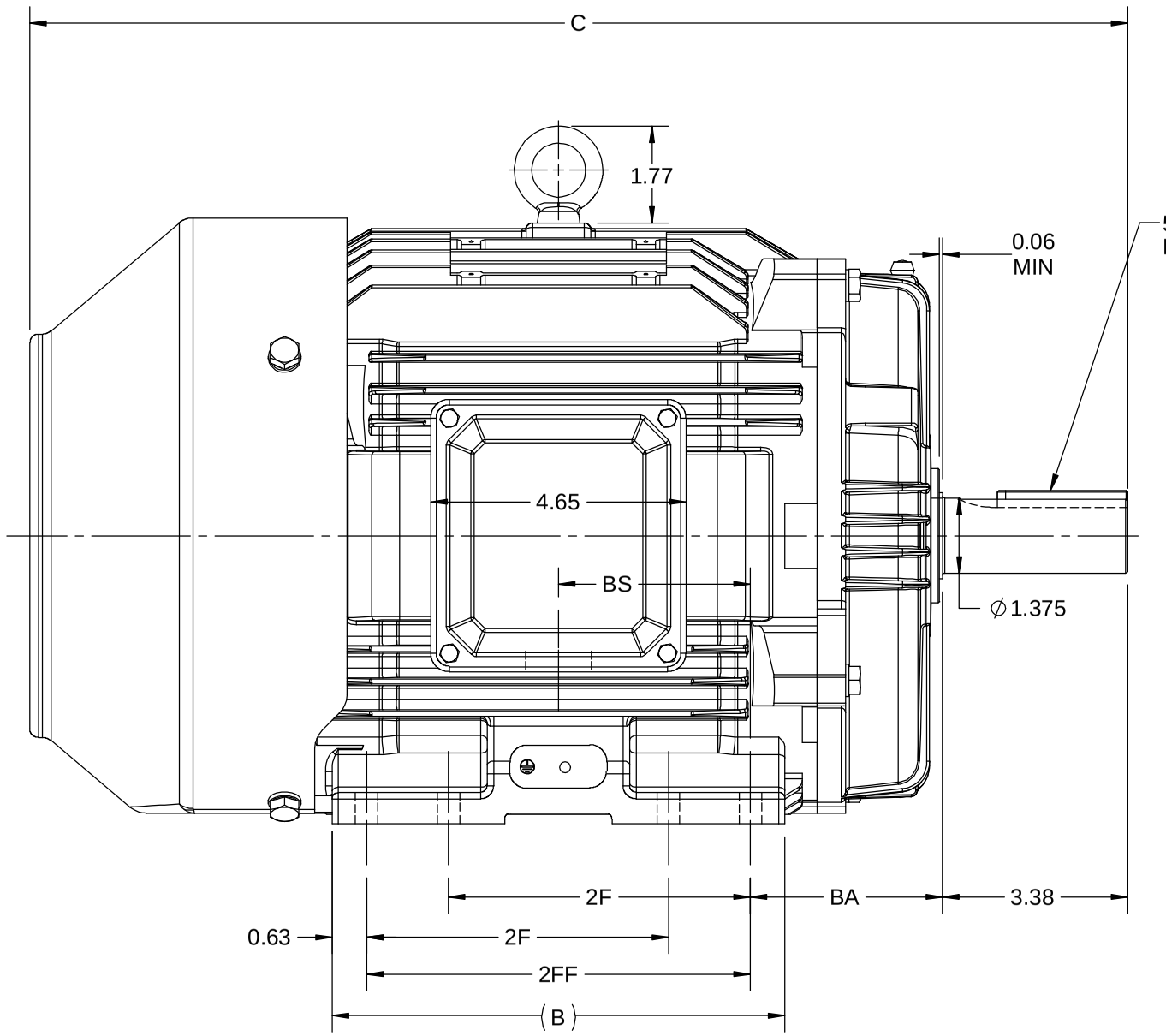
Nameplate Specifications

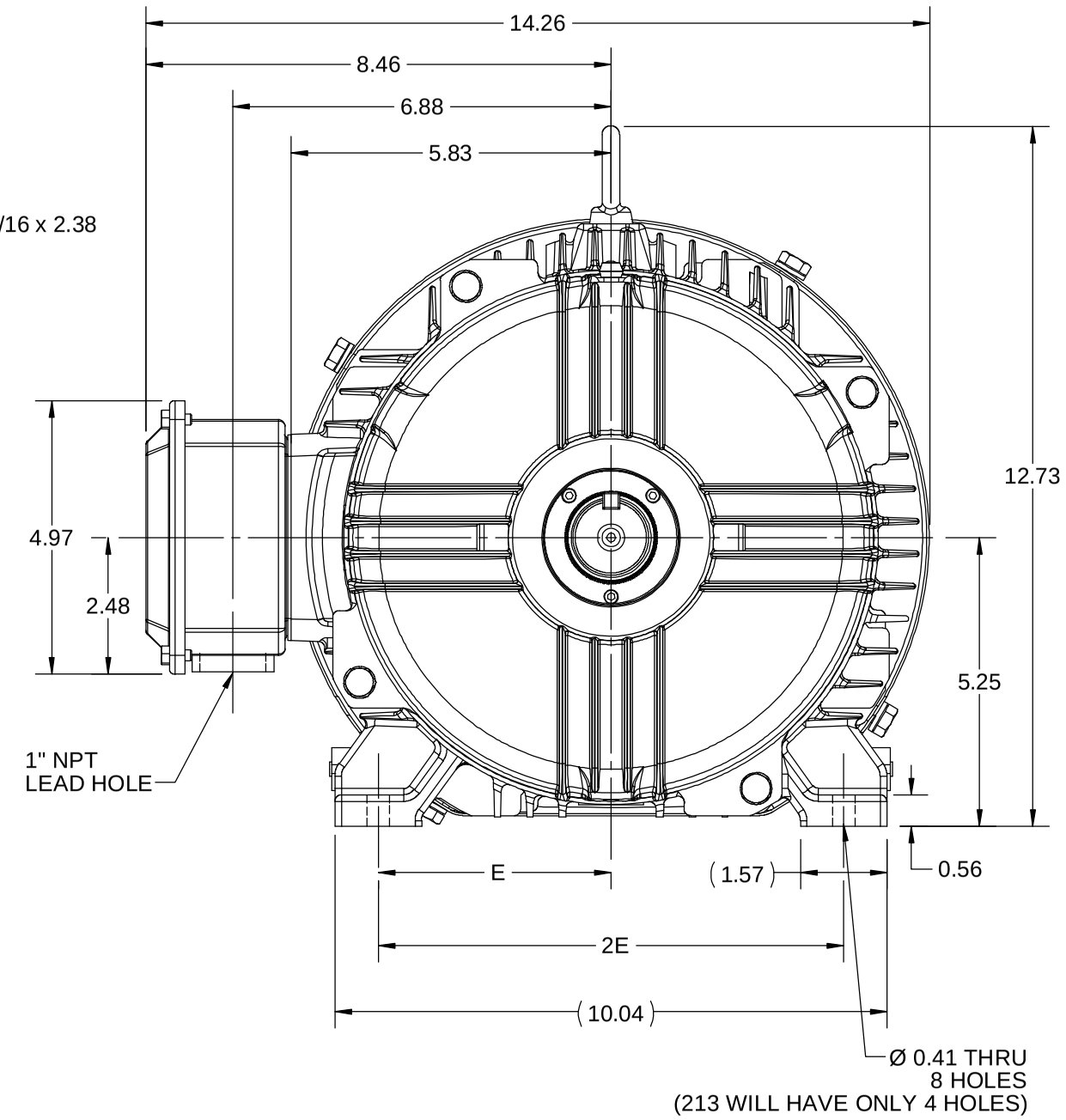
Output HP	**10 Hp**	Output KW	**7.5 kW**
Frequency	**60 Hz**	Voltage	**208-230/460 V**
Current	**27.3-25.0/12.5 A**	Speed	**1762 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**91.7 %**	Power Factor	**81.3**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**H**
Frame	**215T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6308**	Opp Drive End Bearing Size	**6208**
UL	**Listed**	CSA	**Y**
CE	**Y**	IP Code	**55**
Hazardous Location	**DIVISION 2 T2B**		

Technical Specifications

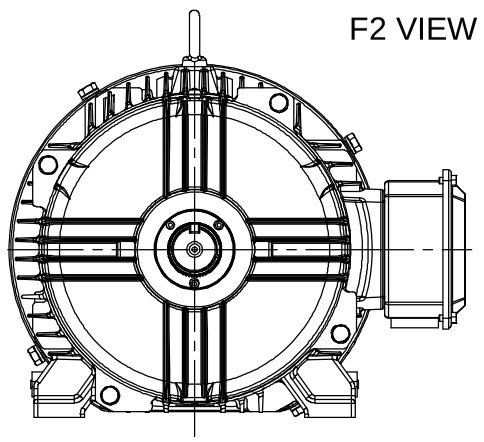
Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Line Or Inverter**
Poles	**4**	Rotation	**Selective Clockwise**
Resistance Main	**1.155 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Cast Iron**
Shaft Type	**T**	Overall Length	**20.30 in**
Shaft Diameter	**1.375 in**	Shaft Extension	**3.38 in**
Assembly/Box Mounting	**F1/F2 CAPABLE**		
Connection Drawing	**EE7308**	Outline Drawing	**SS620702-200**

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	6.76	18.53	4.25	8.50	---	5.50	3.50	2.75	F1 OR F2	213T
200	8.26	20.03			5.50	7.00		3.50		213/215T





F2 VIEW



DRAWING REVISION	REVISION BY	REV DATE/© DATE
C	VS	30-09-2020
ECO	APPROVED BY	DATE
ECO-0194527	GNK	30-09-2020

ECO DESCRIPTION
UPDATED DRAWING

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

DRAWN BY	JOY
DATE	04/05/2015
APPROVED BY	SBD
DATE	04/05/2015
REFERENCE	
THIRD ANGLE PROJECTION	

Regal Beloit America, Inc.

DESCRIPTION
OUTLINE
213/215T FR TEFC- CAST IRON

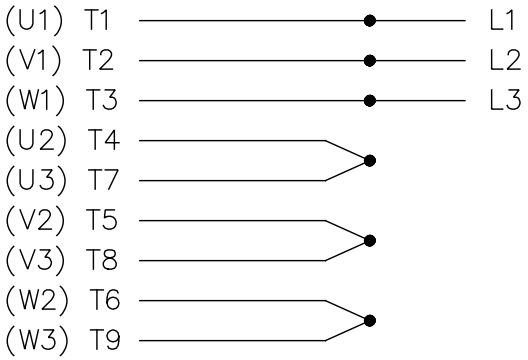
MATERIAL | PROCESS/FINISH

SIZE	DRAWING NUMBER	SHEET
B	SS620702	1 OF 1

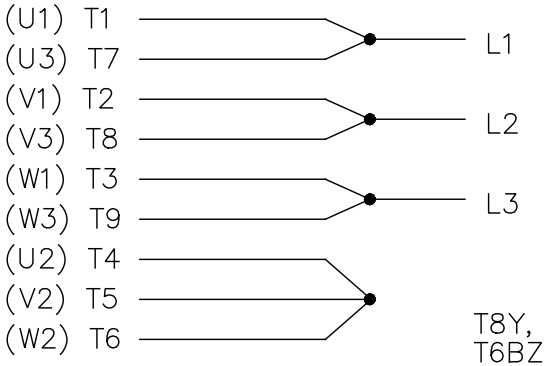
EE7308

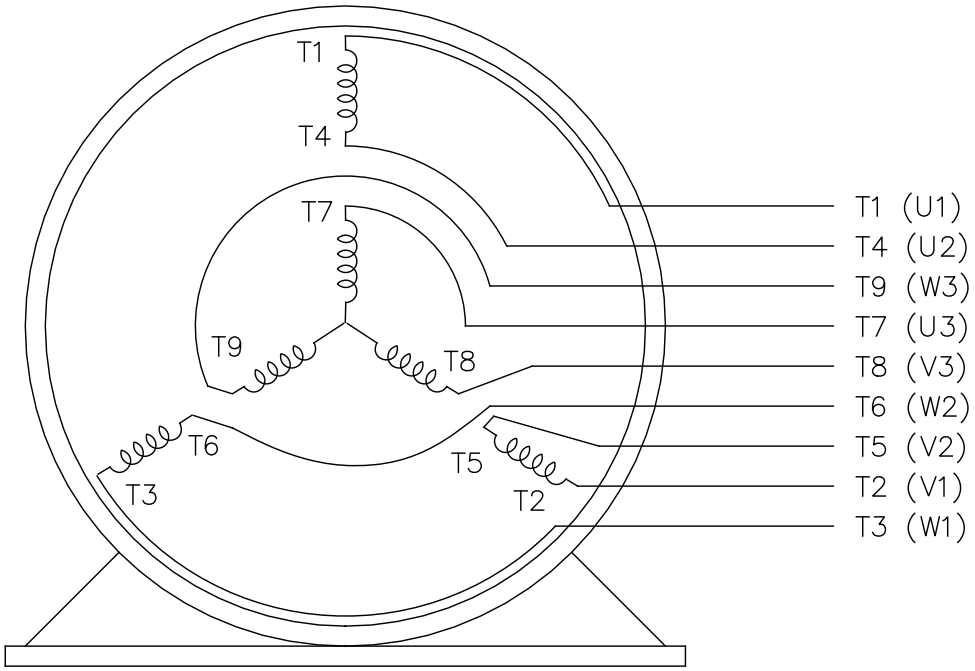
THREE PHASE DUAL VOLTAGE MOTOR

HIGH VOLTAGE



LOW VOLTAGE





VIEW OF TERMINAL END

REF.
WINDING DIAGRAM

T8Y, T2Y, T2BL, T4BX, T2EC, T2G
T6BZ, T2B, T6BL, T4AV, T6B, T4B

OPTIONAL CORD CONNECTION

L1	WHITE
L2	RED
L3	BLACK

NO.	REVISION	BY & DATE	CHK
5	CHG TO REGAL LOGO	SL 09/10/2015	AB
4	REVISED IEC NOTATIONS	MSG 11/15/2011	CMN
3	ADDED IEC NOTATIONS... (U1), (V1) ETC. MU95194	MSG 5/10/2010	MJS
2	ADDED THE OPTIONAL CORD CONNECTION MU46318	RDH 04/24/2003	DRS
1	REDRAWN	RM 11/20/1990	

TOLERANCES UNLESS SPECIFIED

ANG	DEC.	INCHES
	.X	±.1
	.XX	±.02
	.XXX	±.005
	.XXXX	±.0005
ANG		±7'30"

REGAL™ Regal Beloit America, Inc.

TITLE CONNECTION DIAGRAM
3ø – DUAL VOLTAGE MOTOR

MAT'L.

FINISH

CAD FILE ee7308

RFP

DIST WP

DRAWN RM	11/20/1990
CHK ML	11/21/1990
APPD SAS	04/24/2003
SCALE	1=1
REF	
FMF	
PREV	

SIZE	DRAWING NO. PAGE OF	REV.
A	EE7308	5

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

marathon® Motors

DATA VOLTS: 460

CERTIFICATION DATA SHEET

CUSTOMER:
ORDER #:
CONN. DIAGRAM: EE7308
OUTLINE: SS620702-200
WINDING: HA31324013 R1 2
SPEED:

CUSTOMER P.O. #:
REFERENCE MODEL #: 215TTFCD6026
CAT #: GT1019A
CUSTOMER PART #:
MOUNTING: F1/F2 CAPABLE

TYPICAL MOTOR PERFORMANCE DATA

HP	KW	SYNC RPM	FL RPM	FRAME	ENCLOSURE	TYPE	KVA CODE	DESIGN
10	7.5	1800	1762	215T	TEFC	TFC	H	B

PH	HZ	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB	ELEV.
3	60/50	208-230/460#190/380	27.3-25/12.5&23.2/11.6	LINE OR INVERTER	CONT	F	1.15	40	3300

F.L. EFF	91.7	3/4 LD EFF	91.6	1/2 LD EFF	90.8	GTD EFF	ELECT. TYPE
F.L. PF	81.3	3/4 LD PF	76.6	1/2 LD PF	66.0	91.0	SQ CAGE INV RATED

F.L. TORQUE	LR AMPS @ 460 V	L.R. TORQUE	B.D. TORQUE	F.L. RISE (°C)	
29.8 LB-FT	79.0	59.0 LB-FT 198%	74.0 LB-FT 248%	65	

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK²	MAX. LOAD WK²	SAFE STALL TIME	STARTS/HOUR	APROX.	MOTOR WGT
62 dBA	71 dBA	1.10 LB-FT²	85 LB-FT²	25 SEC.	2	210	LB.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	MOTOR ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	NO	DIVISION 2 T2B	NO	NONE	BLUE (ENAMEL)

BEARINGS DE	BEARINGS ODE	GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
BALL 6308	BALL 6208	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON

THERMOSTATS	PROTECTORS	WDG RTD's	BRG RTD's	THERMISTORS	CONTROL	SPACE HEATERS
NONE	NOT	NONE	NONE	NONE	FALSE	NA

R1 (ohms/ph)	R2 (ohms/ph)	X1 (ohms/ph)	X2 (ohms/ph)	Xm (ohms/ph)	VIBRATION (in/sec)	FLOAT
0.741	0.466	2.147	2.579	46.775	0.150	ODE

*
N
O
T
E
S
*

INVERTER TORQUE: CONSTANT 10:1/VARIABLE 10:1
INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE
NONE NONE PPR

BRAKE: NONE
NONE NONE
FT-LB: NA
VOLTAGE: NONE HZ:

PREPARED BY: VINAYAK YERATE
DATE: 9/22/2020

UL: NO LETTER - ME,WUXI TEFC BLUEWHALE CLASS 1 DIV. 2 UL LISTED

FORM: 3531 REV_4 2/27/06

Data Sheet

Date: 9/20/2020
Customer:
Attention:
Submitted by: VINAYAK YERATE

marathon® Motors

215TTFCD6026

Submittal

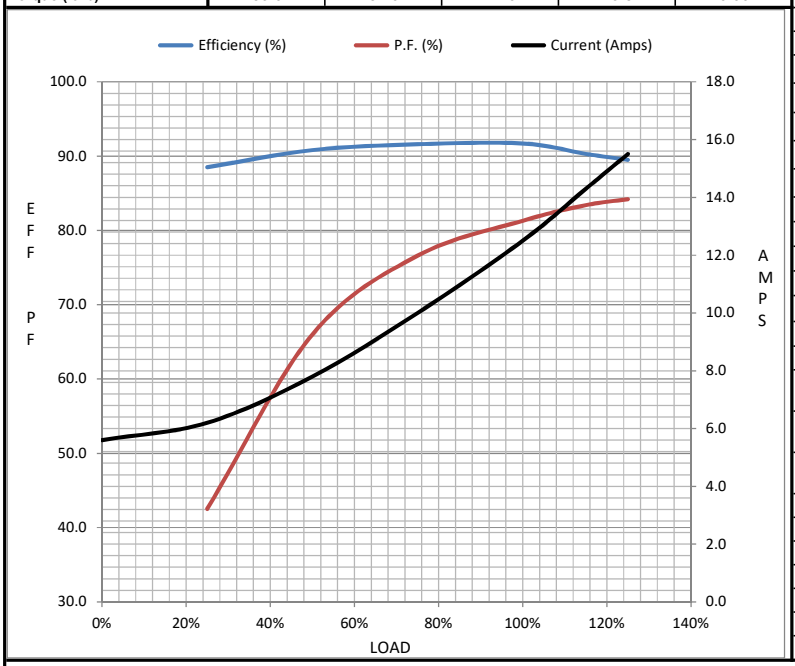
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	5.6	6.2	7.8	10.0	12.5	14.3	15.5	79.0	
Torque (ft-lb)	0.00	7.3	14.7	22.2	29.8	34.4	37.4	59.0	
RPM	1800	1792	1782	1772	1762	1,756	1752	0	
Efficiency (%)		88.5	90.8	91.6	91.7	90.3	89.5		
P.F. (%)	9.0	42.5	66.0	76.6	81.3	83.4	84.2	44.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1565	1762	1800
Current (Amps)	79.0	73.0	45.0	12.5	5.6
Torque (ft-lb)	59.0	51.0	74.0	29.8	0.00

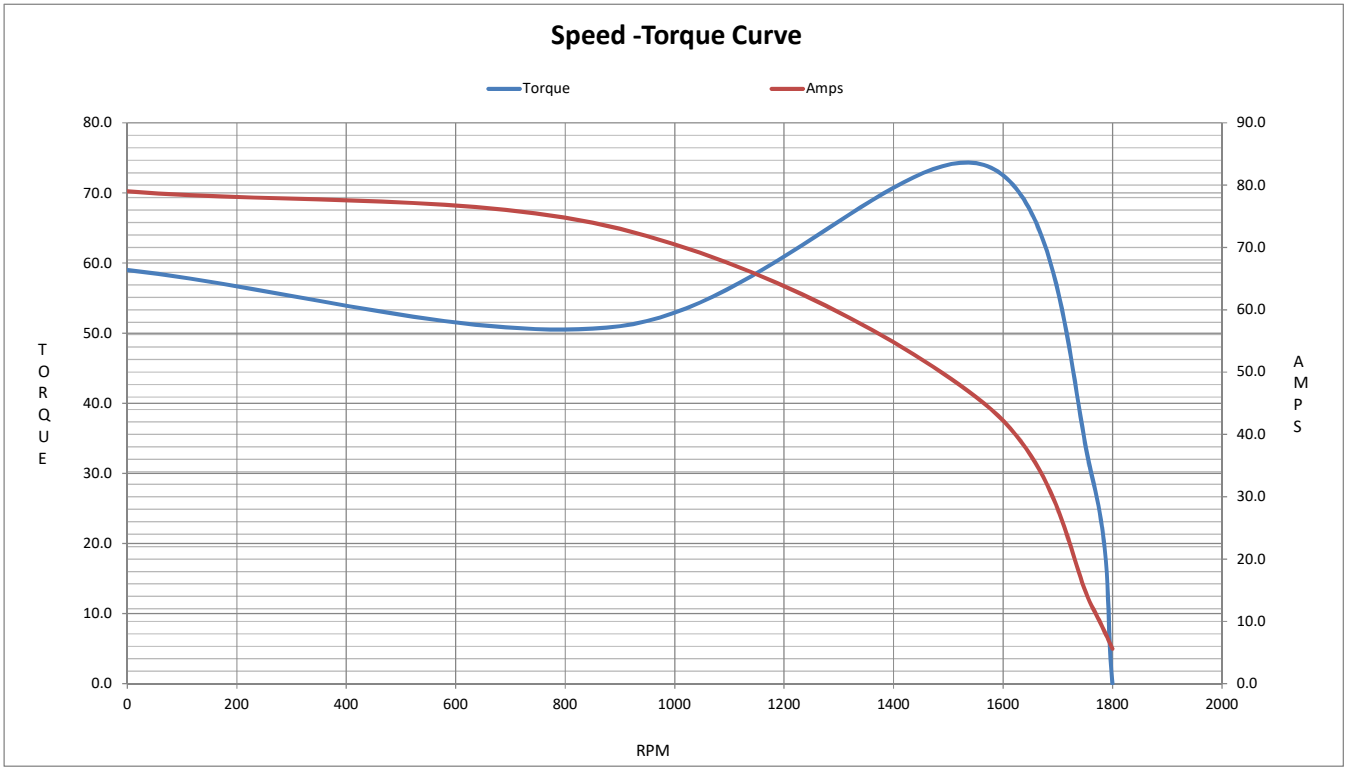


Information Block

HP	10.0
Sync. RPM	1800
Frame	215
Enclosure	TEFC
Construction	TFC
Voltage	208-230/460#190/380 V
Frequency	60 Hz
Design	B
LR Code letter	H
Service Factor	1.15
Temp Rise @ FL	65 ° C
Duty	CONT
Ambient	40 ° C
Elevation	3,300 feet
Rotor/Shaft wk²	1.10 Lb-Ft²
Ref Wdg	HA31324013 R1
Sound Pressure @ 1M	62 dBA
VFD Rating	CONSTANT 10:1/VARIABLE 10:1
Outline Dwg	SS620702-200
Conn. Diag	EE7308
Additional Specifications:	
0	
0	

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.7410	0.4660	2.1470	2.5790	46.7750



PRODUCT INFORMATION PACKET

Model No: 254TTFCD6026
Catalog No: GT1022A
15 HP General Purpose Motor, 3 phase, 1800 RPM, 208-230/460 V, 254T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

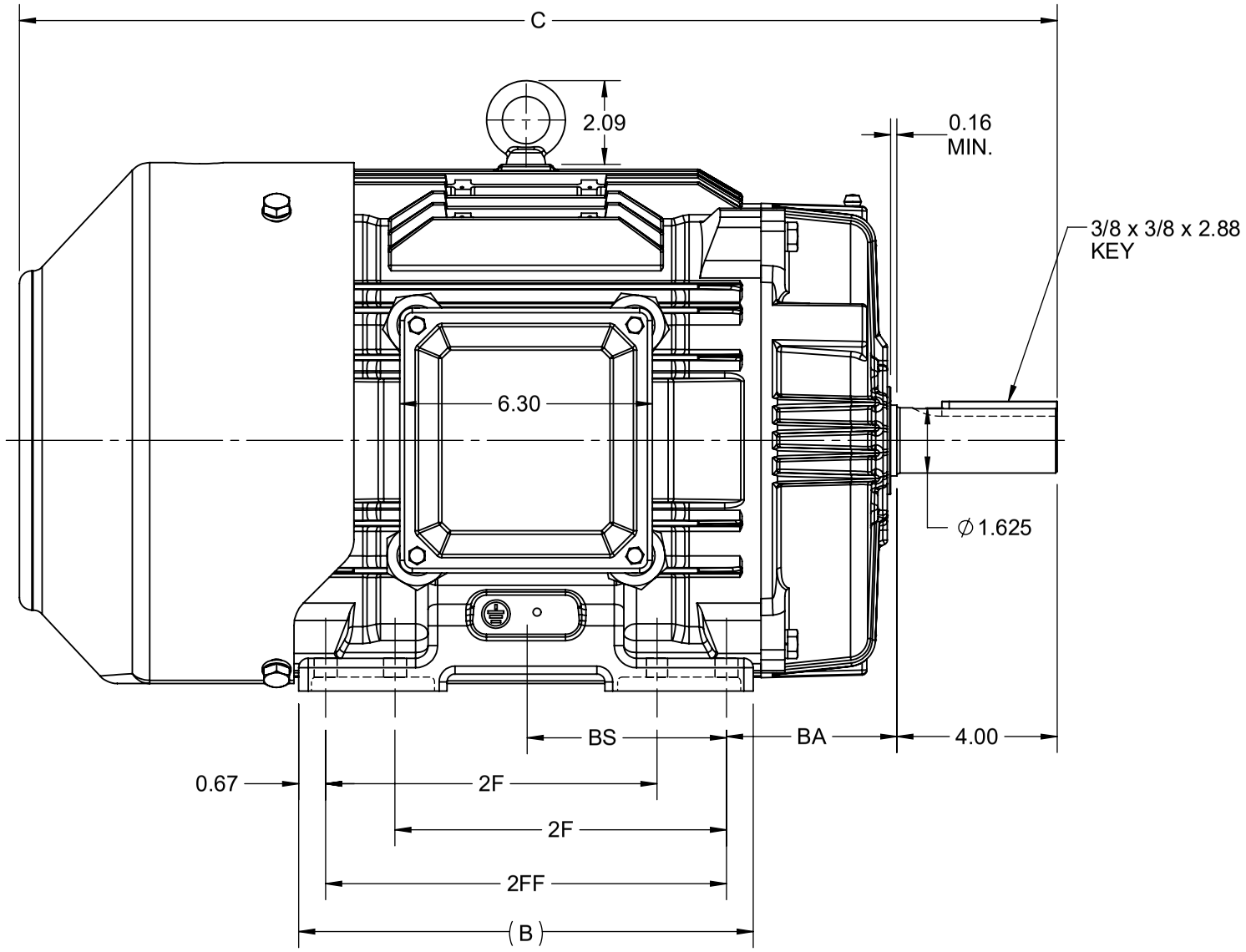
Nameplate Specifications

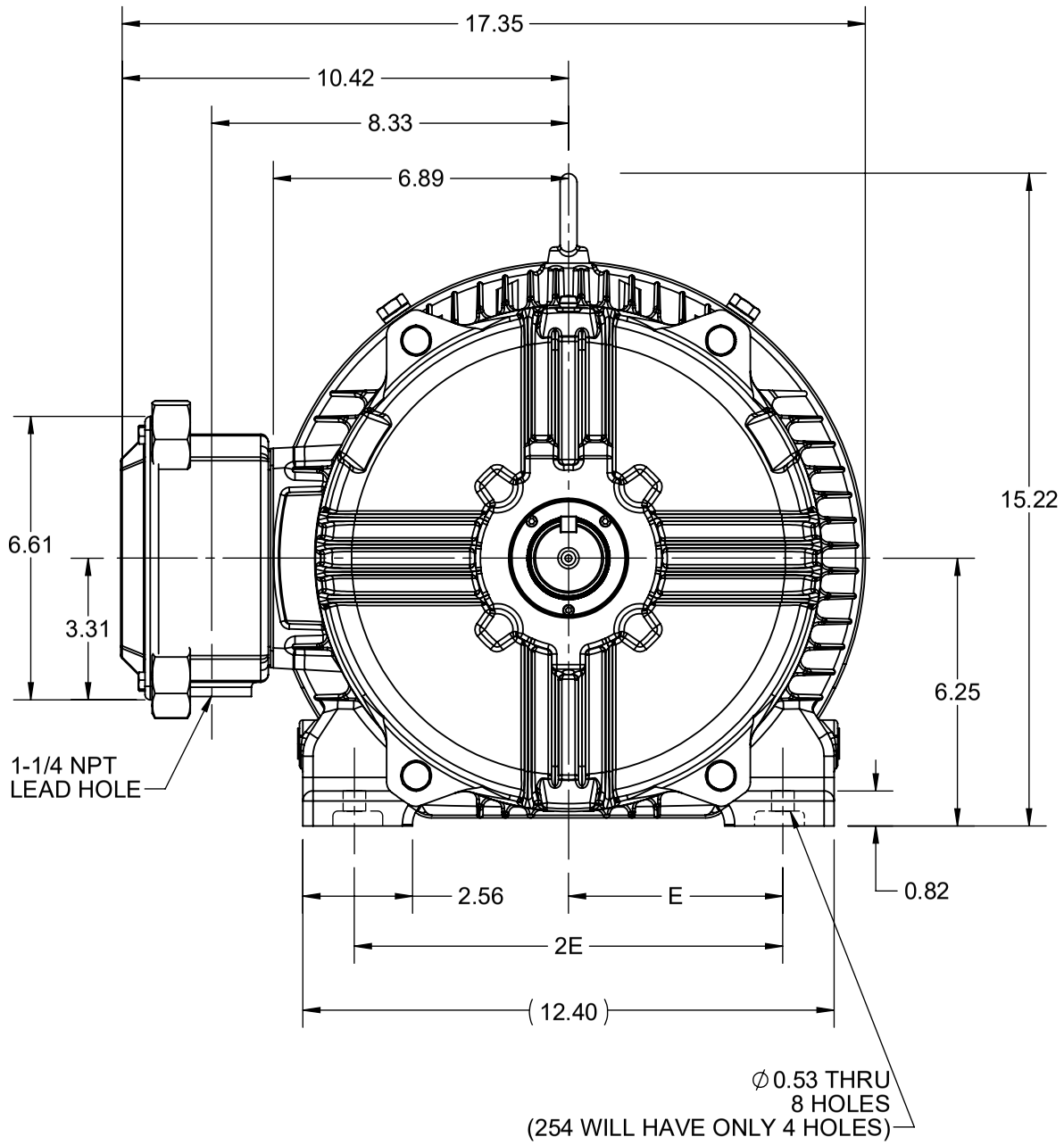
Output HP	**15 Hp**	Output KW	**11.2 kW**
Frequency	**60 Hz**	Voltage	**208-230/460 V**
Current	**40.0-37.5/18.8 A**	Speed	**1772 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**92.4 %**	Power Factor	**82**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**G**
Frame	**254T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6309**	Opp Drive End Bearing Size	**6209**
UL	**Listed**	CSA	**Y**
CE	**Y**	IP Code	**55**
Hazardous Location	**DIVISION 2 T2B**		

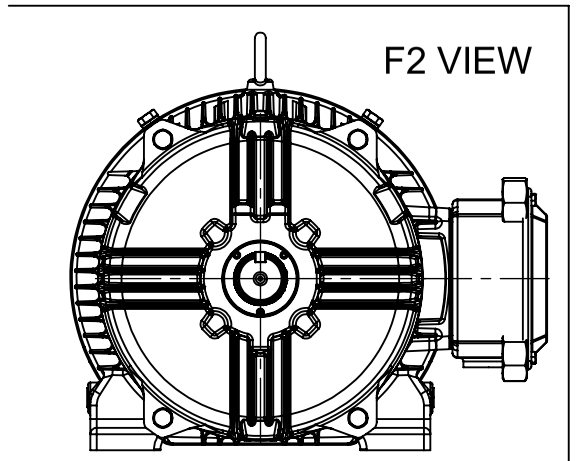
Technical Specifications

Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Line Or Inverter**
Poles	**4**	Rotation	**Selective Clockwise**
Resistance Main	**.61 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Cast Iron**
Shaft Type	**T**	Overall Length	**24.15 in**
Shaft Diameter	**1.625 in**	Shaft Extension	**4 in**
Assembly/Box Mounting	**F1/F2 CAPABLE**		
Connection Drawing	**EE7308K**	Outline Drawing	**SS620703-100**

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	9.60	24.15	5.00	10.00	-	8.25	4.25	4.13	F1 OR F2	254T
200	11.34	25.89			8.25	10.00		5.00		254/256T







DRAWING REVISION	REVISION BY	REV DATE/© DATE
D	SVP	04/06/2021
ECO	APPROVED BY	DATE
CR-0001991	AK	04/06/2021
ECO DESCRIPTION		
DXF FILE RELEASED TO IDS		

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

DRAWN BY	MR
DATE	4/5/2015
APPROVED BY	KRK
DATE	4/5/2015
REFERENCE	
THIRD ANGLE PROJECTION	

REGAL® Regal Beloit America, Inc.

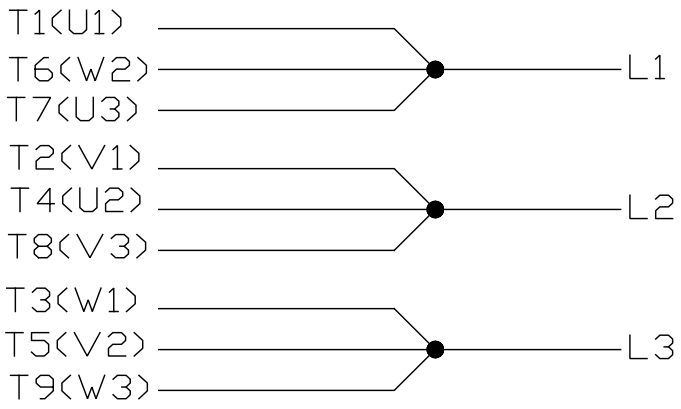
DESCRIPTION
OUTLINE
254/256T FR-TEFC-CAST IRON

MATERIAL	PROCESS/FINISH

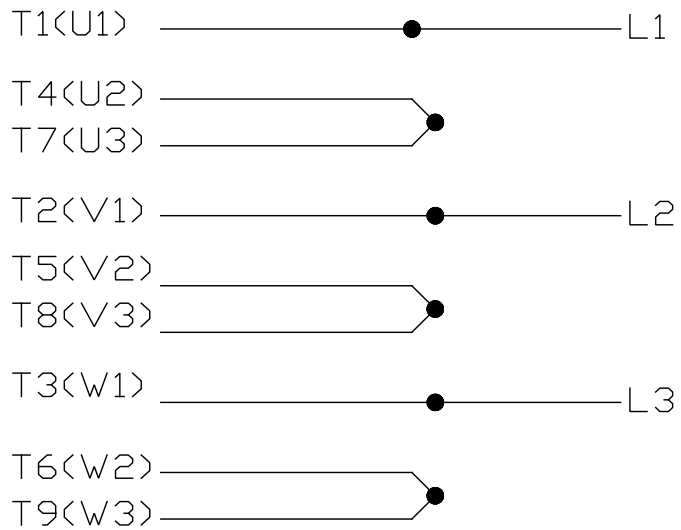
SIZE	DRAWING NUMBER	SHEET
B	SS620703	1 OF 1

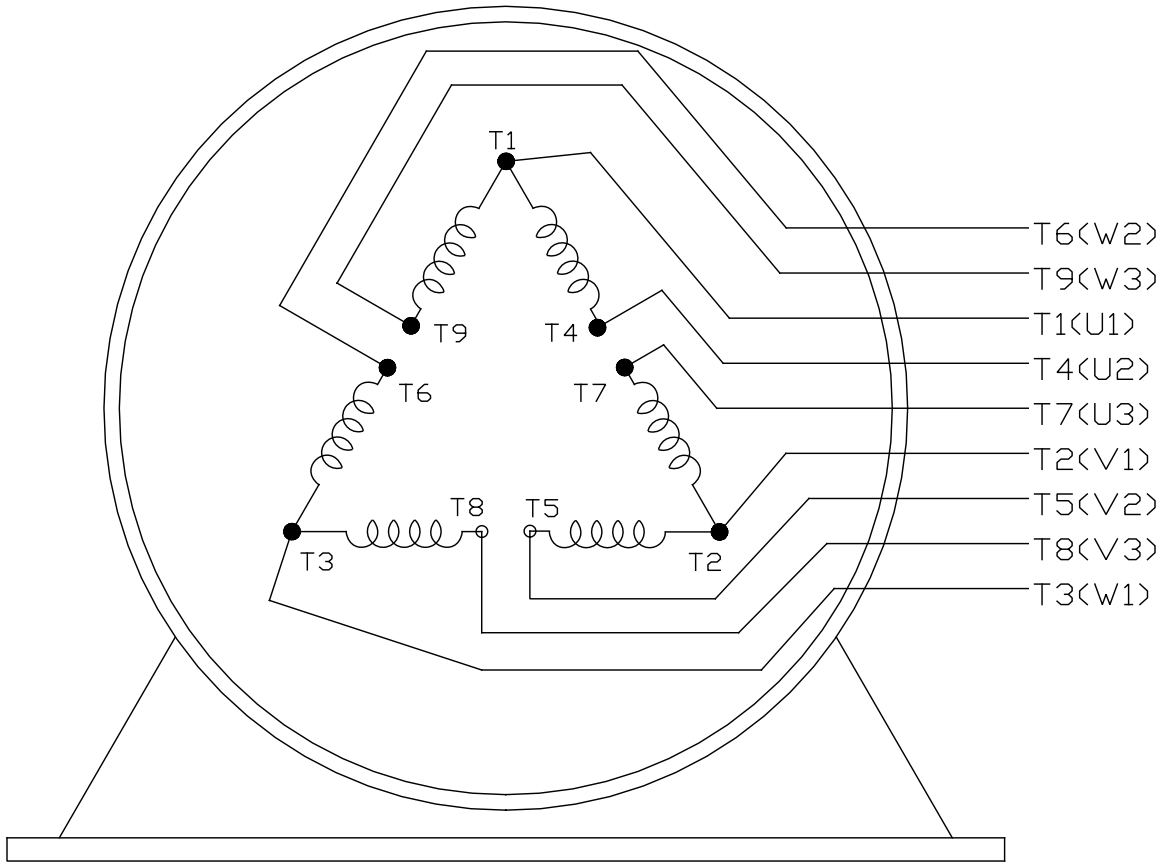
EE7308K

LOW VOLTAGE



HIGH VOLTAGE





VIEW OF TERMINAL END

NO.	REVISION	BY & DATE	CHK
E	CORRECTED IEC MARKINGS ECO-0111208	WGJ 01-23-2017	EMH
D	RE-DRAWN WITH REGAL LOGO ECO-0110493	WGJ 09-30-2016	EMH
8	ADDED IEC DESIGNATIONS MU95020	TJW 4/30/2010	MJS
7	REVISD HIGH VOLTAGE L2 WAS L3 CN52600-354	MRB 09-21-1998	
6	REDRAWN ON CADD	PGK 06-05-1997	

TOLERANCES UNLESS SPECIFIED

DEC.	INCHES
.X	±.1
.XX	±.02
.XXX	±.005
.XXXX	±.0005
ANG	±7'30"

REGAL - BELOIT CORPORATION

TITLE: CONNECTION DIAGRAM
DELTA CON. - 3Ø - 9 LEADS

MAT'L.

FINISH

CAD FILE EE7308K

RFP

DIST

DRAWN PGK 06-04-1997
CHK ML 06-05-1997
APPD GK 06-15-1997
SCALE
REF
FMF
PREV

SIZE A | DRAWING NO. EE7308K | PAGE OF | REV. E

marathon electric

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 254TTFCD6026 BB

CONN. DIAGRAM: A-EE7308K

CUSTOMER PART #:

OUTLINE: B-SS620703

MOUNTING: F1/F2 CAPABLE

WINDING #: HE31604011 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
15&10	11.2&7.50	1800	1772&1478	254T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	37.5/18.8&31.5/15.7	LINE OR INVERTER	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	92.4&92.1	3/4 LOAD EFF:	92.4	1/2 LOAD EFF:	91.7	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	82&78.5	3/4 LOAD PF:	76.5	1/2 LOAD PF:	65.5	91.7	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
44.5 LB-FT	226 / 113	91 LB-FT 204 %	118 LB-FT 265 %	50

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
65 dBA	75 dBA	2.4 LB-FT^2	110 LB-FT^2	20 SEC.	2	299 LBS.

***** SUPPLEMENTAL INFORMATION *****

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6309	6209						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

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INVERTER
TORQUE: CONSTANT 20:1/VARIABLE 20:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:10:08 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 7/16/2020
Customer:
Attention:
Submitted by:

marathon® electric

254TTFCD6026

Submittal

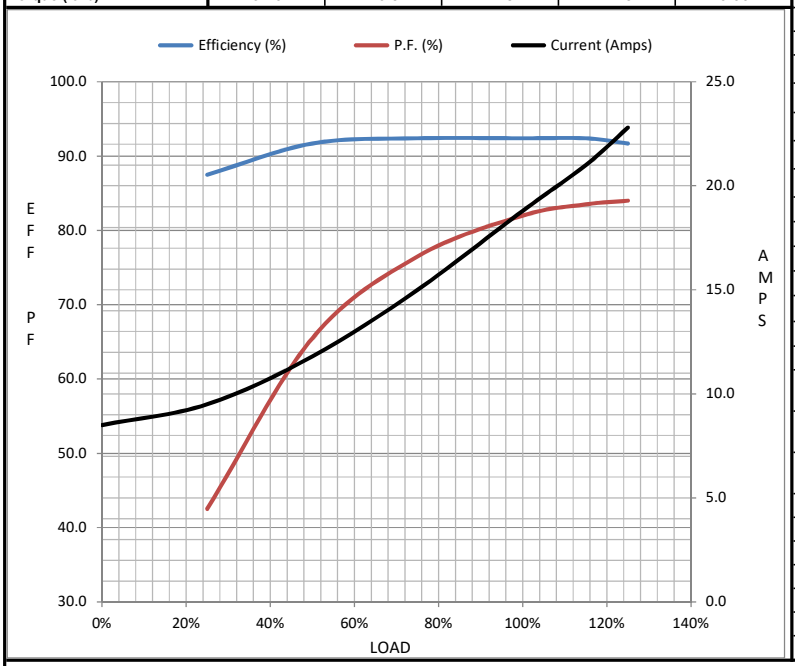
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	8.5	9.5	11.8	15.0	18.8	21.0	22.8	113	
Torque (ft-lb)	0.00	11.0	22.0	33.5	44.5	51.5	56.0	91.0	
RPM	1800	1792	1785	1780	1772	1,768	1762	0	
Efficiency (%)		87.5	91.7	92.4	92.4	92.4	91.7		
P.F. (%)	5.0	42.5	65.5	76.5	82.0	83.5	84.0	41.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1622	1772	1800
Current (Amps)	113	100	66.0	18.8	8.5
Torque (ft-lb)	91.0	76.5	118	44.5	0.00

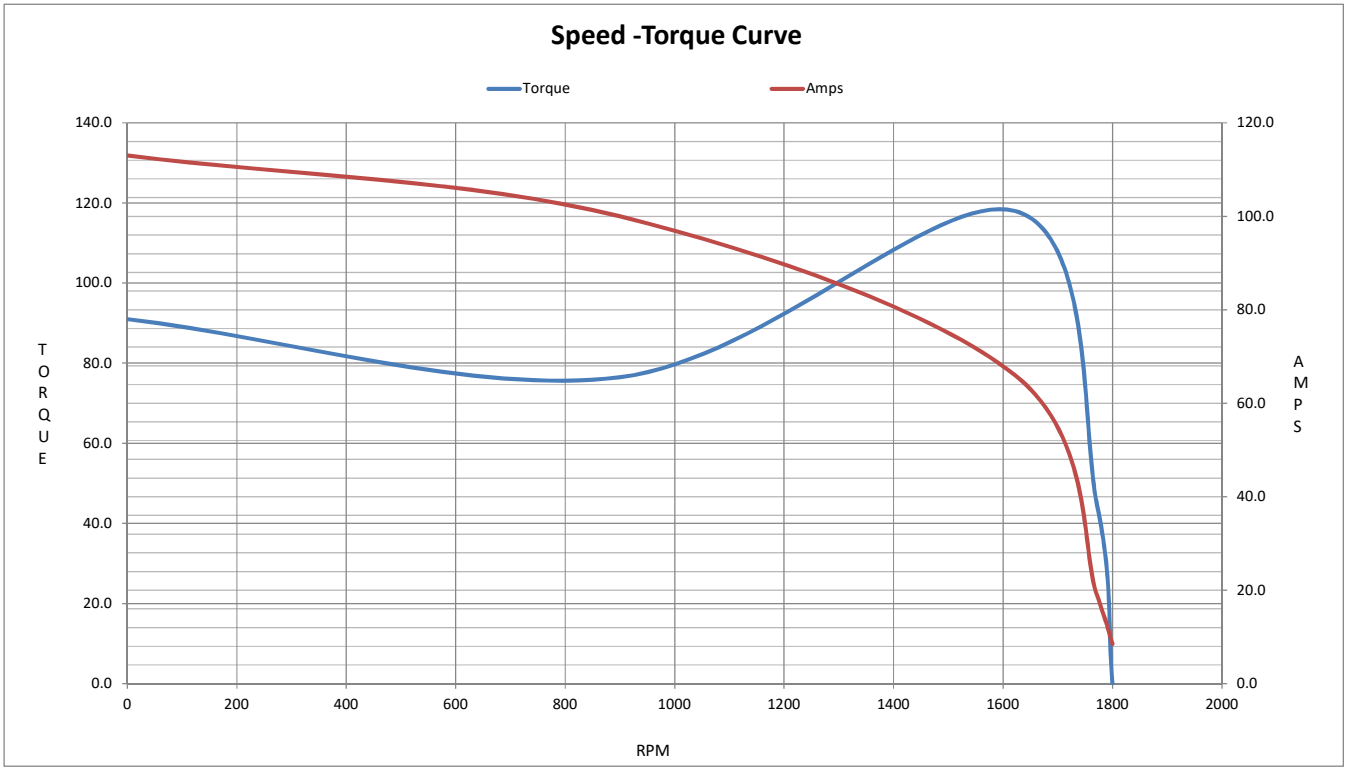


Information Block

HP	15.0
Sync. RPM	1800
Frame	254
Enclosure	TEFC
Construction	TFC
Voltage	208-230/460#190/380 V
Frequency	60 Hz
Design	B
LR Code letter	G
Service Factor	1.15
Temp Rise @ FL	50 ° C
Duty	CONT
Ambient	40 ° C
Elevation	3,300 feet
Rotor/Shaft wk²	2.40 Lb-Ft²
Ref Wdg	HA31604019 NONE
Sound Pressure @ 1M	65 dBA
VFD Rating	CONSTANT 10:1/VARIABLE 10:1
Outline Dwg	037898-912
Conn. Diag	EE7308K
Additional Specifications:	
0	
0	

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.4400	0.2440	1.3040	1.4670	31.5630



PRODUCT INFORMATION PACKET

Model No: 256TTFCD6026
Catalog No: GT1025A
20 HP General Purpose Motor, 3 phase, 1800 RPM, 208-230/460 V, 256T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

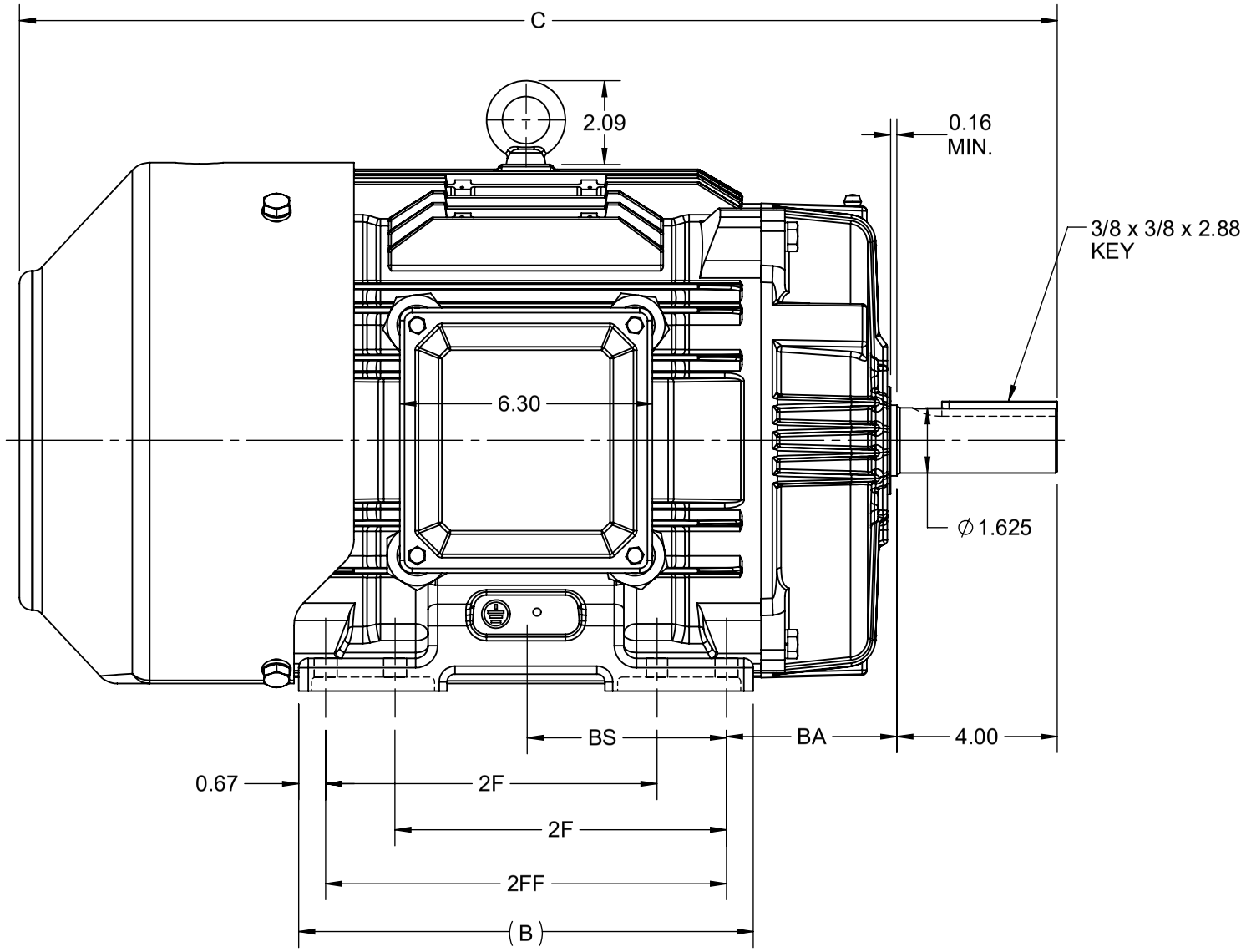
Nameplate Specifications

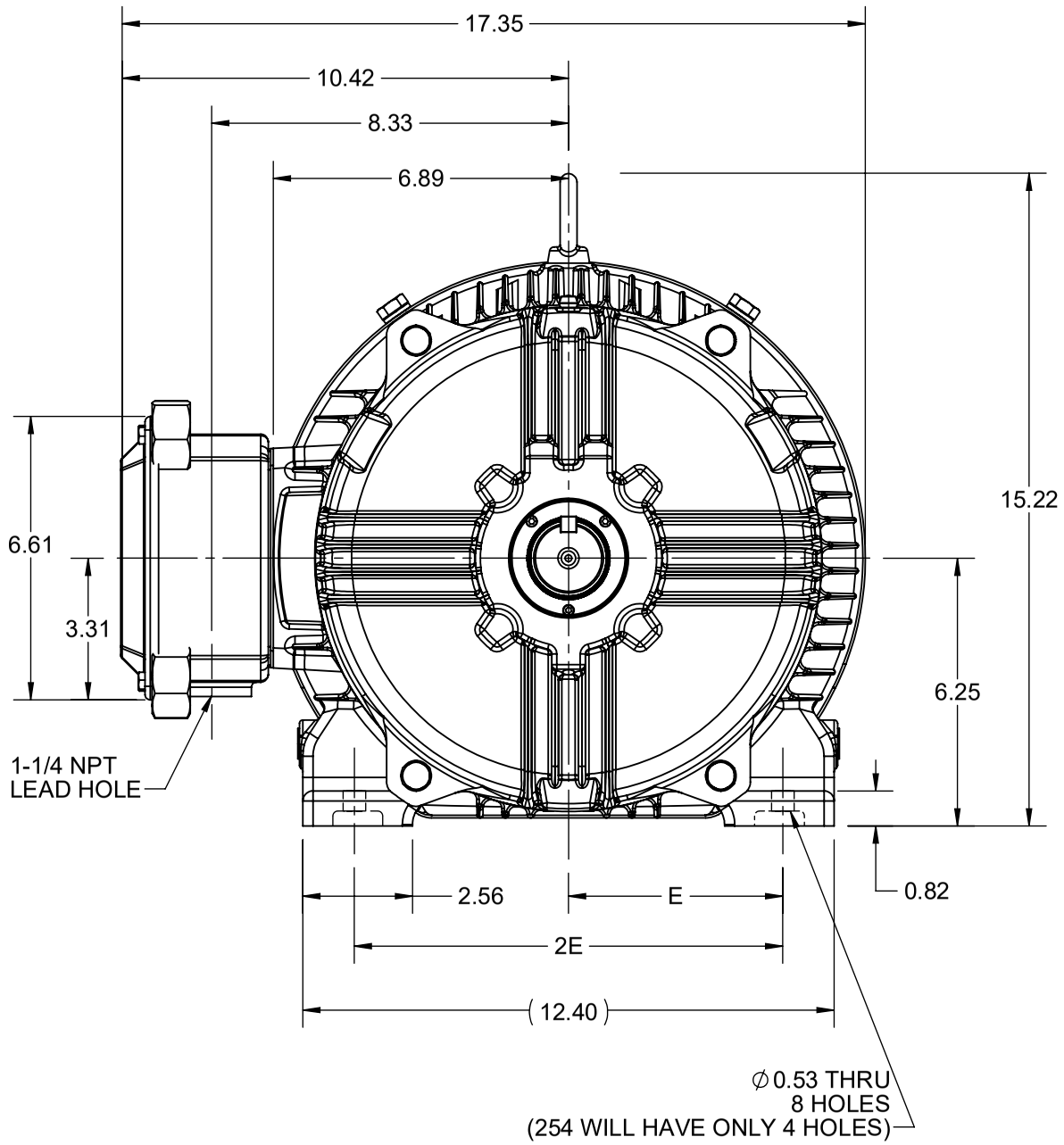
Output HP	**20 Hp**	Output KW	**14.9 kW**
Frequency	**60 Hz**	Voltage	**208-230/460 V**
Current	**53.0-48.5/24.2 A**	Speed	**1768 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**93 %**	Power Factor	**83.5**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**G**
Frame	**256T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6309**	Opp Drive End Bearing Size	**6209**
UL	**Listed**	CSA	**Y**
CE	**Y**	IP Code	**55**
Hazardous Location	**DIVISION 2 T2B**		

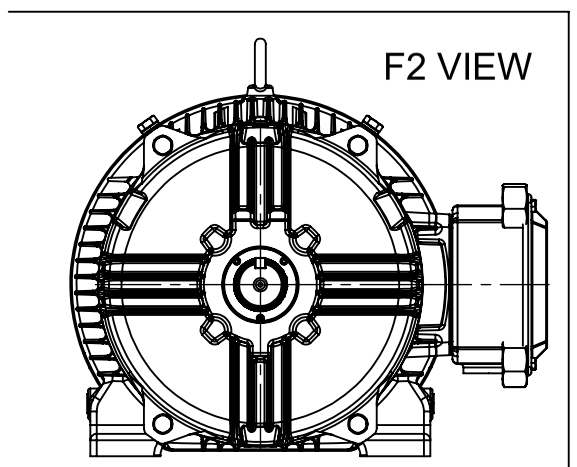
Technical Specifications

Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Line Or Inverter**
Poles	**4**	Rotation	**Selective Clockwise**
Resistance Main	**.513 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Cast Iron**
Shaft Type	**T**	Overall Length	**25.89 in**
Shaft Diameter	**1.625 in**	Shaft Extension	**4 in**
Assembly/Box Mounting	**F1/F2 CAPABLE**		
Connection Drawing	**EE7308K**	Outline Drawing	**SS620703-200**

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	9.60	24.15	5.00	10.00	-	8.25	4.25	4.13	F1 OR F2	254T
200	11.34	25.89			8.25	10.00		5.00		254/256T







DRAWING REVISION	REVISION BY	REV DATE/© DATE
D	SVP	04/06/2021
ECO	APPROVED BY	DATE
CR-0001991	AK	04/06/2021
ECO DESCRIPTION		
DXF FILE RELEASED TO IDS		

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

DRAWN BY	MR
DATE	4/5/2015
APPROVED BY	KRK
DATE	4/5/2015
REFERENCE	
THIRD ANGLE PROJECTION	

REGAL® Regal Beloit America, Inc.

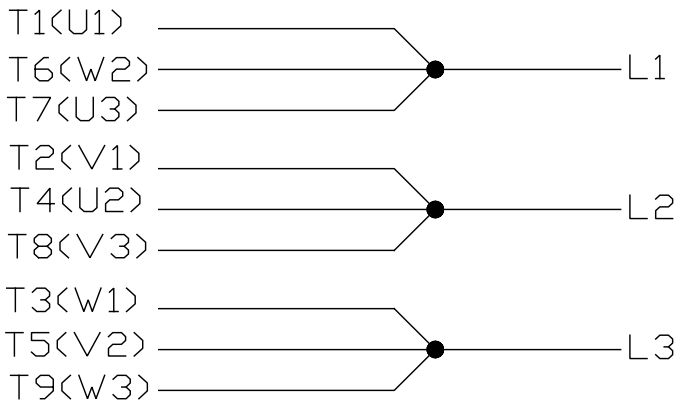
DESCRIPTION
OUTLINE
254/256T FR-TEFC-CAST IRON

MATERIAL	PROCESS/FINISH

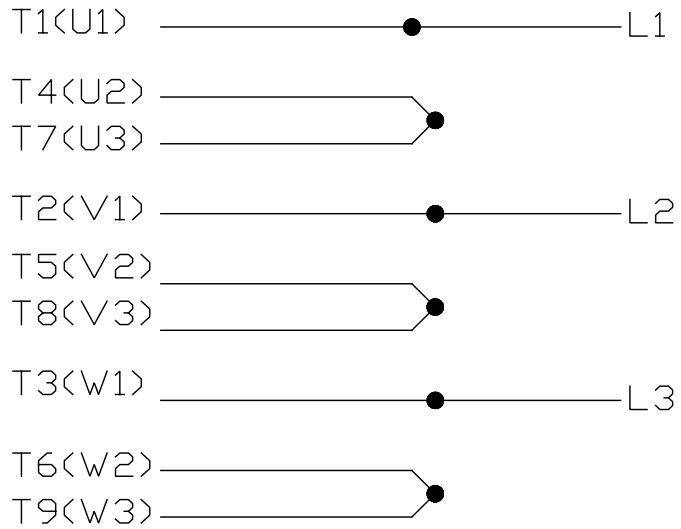
SIZE	DRAWING NUMBER	SHEET
B	SS620703	1 OF 1

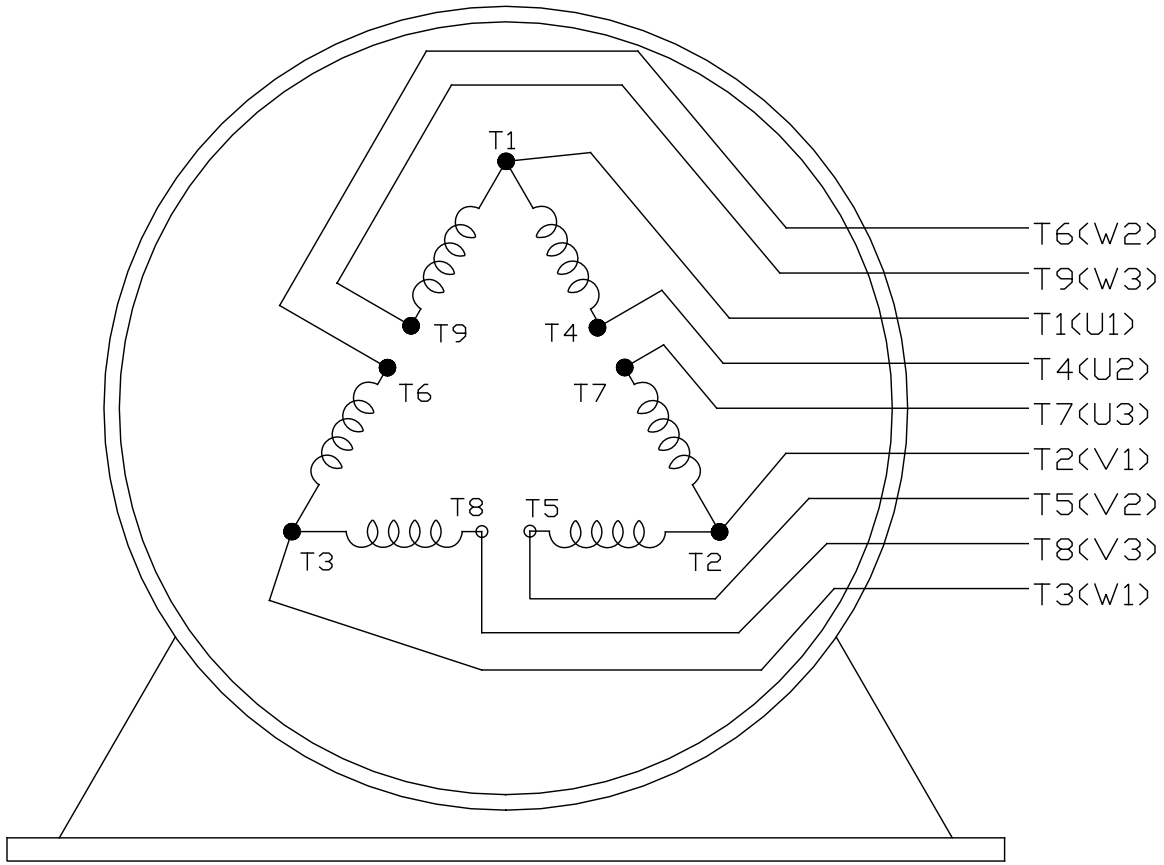
EE7308K

LOW VOLTAGE



HIGH VOLTAGE





VIEW OF TERMINAL END

				TOLERANCES UNLESS SPECIFIED		REGAL - BELOIT CORPORATION	DRAWN PGK 06-04-1997
E	CORRECTED IEC MARKINGS ECO-0111208	WGJ 01-23-2017	EMH	DEC.	INCHES		CHK ML 06-05-1997
D	RE-DRAWN WITH REGAL LOGO ECO-0110493	WGJ 09-30-2016	EMH	.X	±.1		APPD GK 06-15-1997
8	ADDED IEC DESIGNATIONS MU95020	TJW 4/30/2010	MJS	.XX	±.02	TITLE CONNECTION DIAGRAM DELTA CON. - 3Ø - 9 LEADS	SCALE
7	REVISD HIGH VOLTAGE L2 WAS L3 CN52600-354	MRB 09-21-1998		.XXX	±.005		REF
6	REDRAWN ON CADD	PGK 06-05-1997		.XXXX	±.0005	MAT'L.	FMF
NO.	REVISION	BY & DATE	CHK	ANG	±7'30"	FINISH	PREV

RFP

DIST

CAD FILE EE7308K

SIZE	DRAWING NO. PAGE OF	REV.
A	EE7308K	E

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 256TTFCD6026 BB

CONN. DIAGRAM: A-EE7308K

CUSTOMER PART #:

OUTLINE: SS620703

MOUNTING: F1/F2 CAPABLE

WINDING #: HE31604010 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
20&15	14.9&11.2	1800	1768&1472	256T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	208-230/460&190/380	53-48.5/24.2&44.5/22.3	LINE OR INVERTER	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	93&92.7	3/4 LOAD EFF:	93	1/2 LOAD EFF:	91.7	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	83.5&83	3/4 LOAD PF:	79	1/2 LOAD PF:	69	92.4	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
59.4 LB-FT	288 / 144	119 LB-FT 200 %	146 LB-FT 246 %	60

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
65 dBA	75 dBA	3.8 LB-FT^2	125 LB-FT^2	20 SEC.	2	335 LBS.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6309	6209						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

*** N O T E S ***

INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:18:37 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 12/13/2018
Customer:
Attention:
Submitted by: FAREEDA DUDEKULA

marathon® electric

256TTFCD6026

Submittal

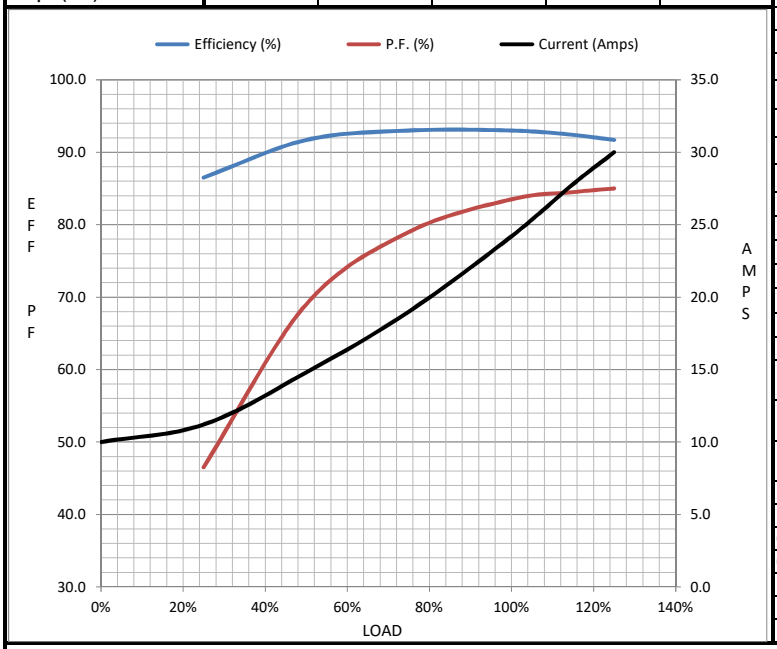
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	10.0	11.2	14.8	19.0	24.2	27.8	30.0	144	
Torque (ft-lb)	0.00	14.6	29.5	44.4	59.4	68.5	74.7	119	
RPM	1800	1792	1785	1778	1768	1,762	1760	0	
Efficiency (%)		86.5	91.7	93.0	93.0	92.4	91.7		
P.F. (%)	5.0	46.5	69.0	79.0	83.5	84.5	85.0	42.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1618	1768	1800
Current (Amps)	144	131	81.0	24.2	10.0
Torque (ft-lb)	119	99.0	146	59.4	0.00

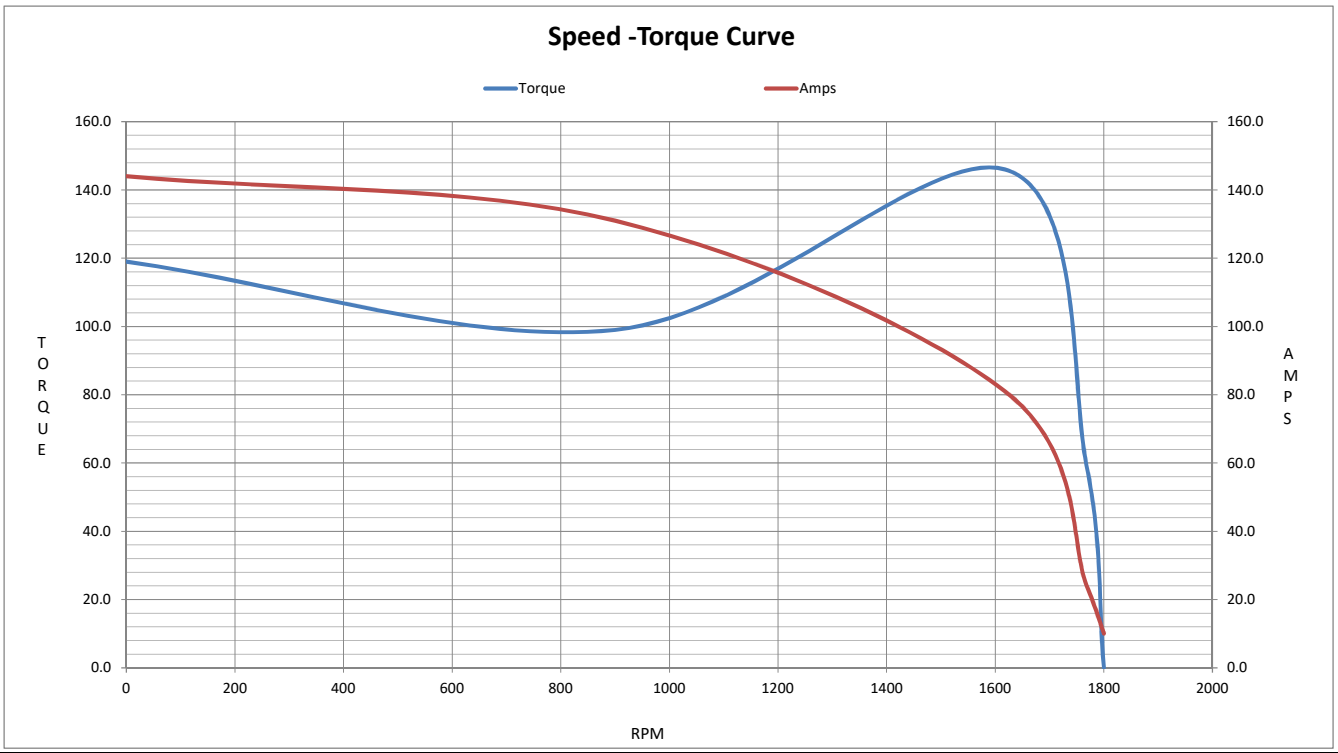


Information Block

HP	20.0	
Sync. RPM	1800	
Frame	256	
Enclosure	TEFC	
Construction	TFC	
Voltage	208-230/460#190/380	V
Frequency	60	Hz
Design	B	
LR Code letter	G	
Service Factor	1.15	
Temp Rise @ FL	60	° C
Duty	CONT	
Ambient	40	° C
Elevation	1,000	feet
Rotor/Shaft wk²	3.8	Lb-Ft²
Ref Wdg	HE31604010 NONE	
Sound Pressure @ 1M	65	dBA
VFD Rating	VARIABLE 10:1	
Outline Dwg	SS620703	
Conn. Diag	A-EE7308K	
Additional Specifications:		
0		
0		

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.3410	0.2030	1.0370	1.2500	26.9800



PRODUCT INFORMATION PACKET

Model No: 284TTFCD6026
Catalog No: GT1028A
25 HP General Purpose Motor, 3 phase, 1800 RPM, 208-230/460 V, 284T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

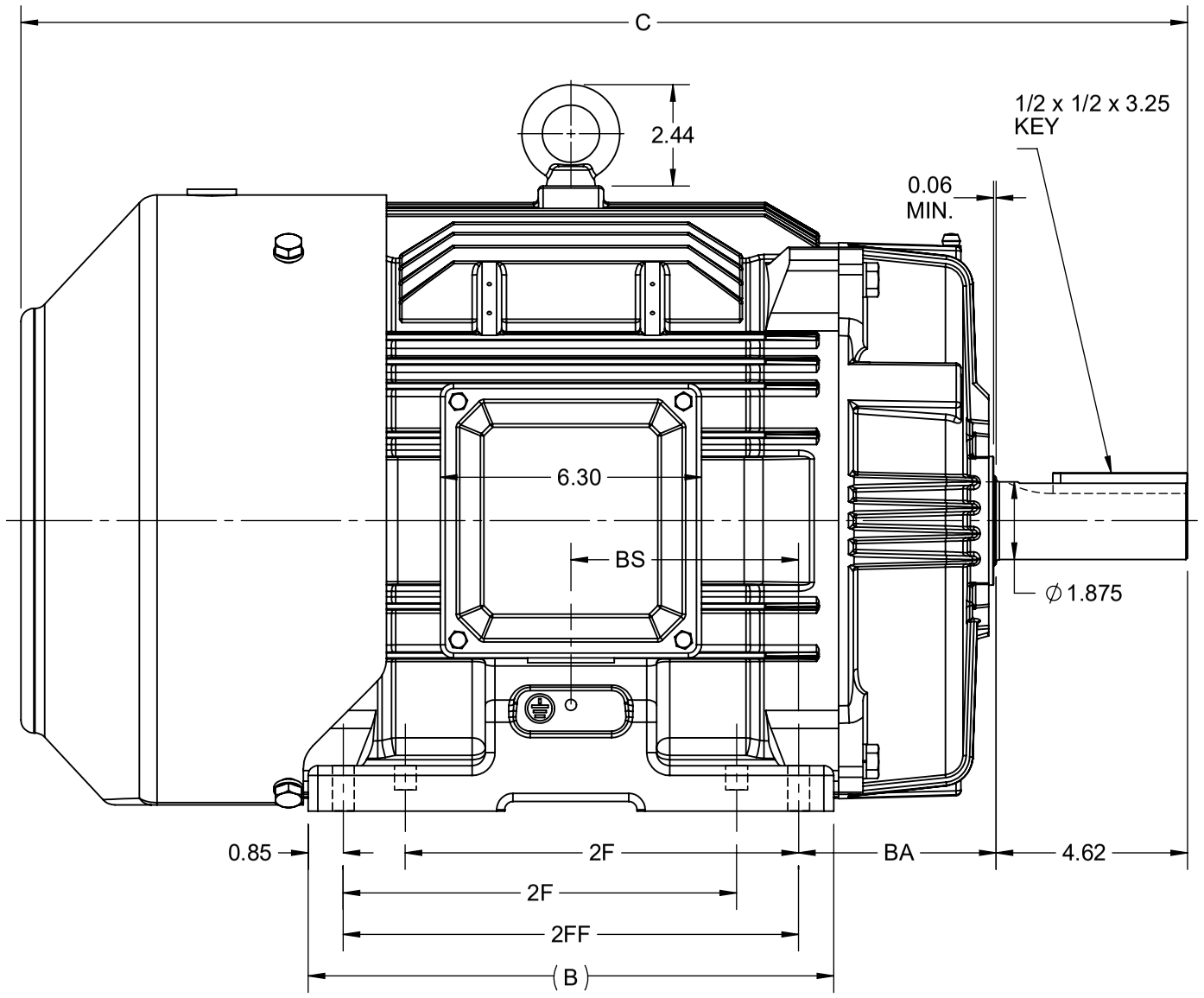
Nameplate Specifications

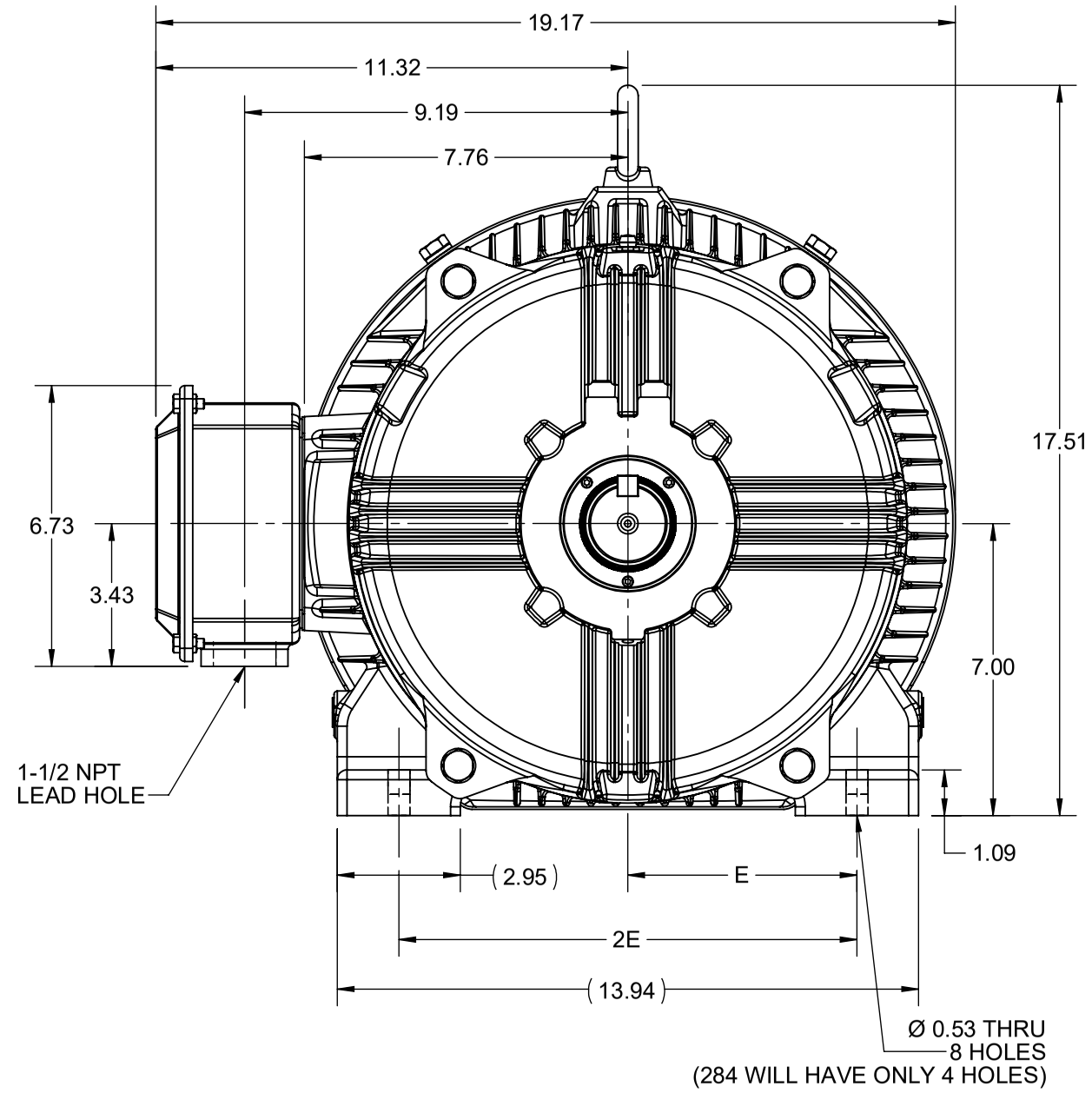
Output HP	25 Hp	Output KW	18.7 kW
Frequency	60 Hz	Voltage	208-230/460 V
Current	65.0-60.0/30.0 A	Speed	1772 rpm
Service Factor	1.15	Phase	3
Efficiency	93.6 %	Power Factor	83
Duty	Continuous	Insulation Class	F
Design Code	B	KVA Code	G
Frame	284T	Enclosure	Totally Enclosed Fan Cooled
Thermal Protection	No	Ambient Temperature	40 °C
Drive End Bearing Size	6311	Opp Drive End Bearing Size	6211
UL	Listed	CSA	Y
CE	Y	IP Code	55
Hazardous Location	DIVISION 2 T2B		

Technical Specifications

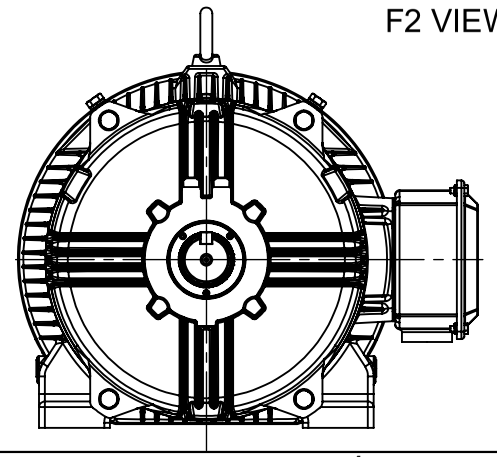
Electrical Type	Squirrel Cage Inverter Rated	Starting Method	Part Wdg Start Low Volt Only & Wye Start Delta Run Or Inverter
Poles	4	Rotation	Selective Clockwise
Resistance Main	.2988 Ohms	Mounting	Rigid Base
Motor Orientation	Horizontal	Drive End Bearing	Ball
Opp Drive End Bearing	Ball	Frame Material	Cast Iron
Shaft Type	T	Overall Length	26.65 in
Shaft Diameter	1.875 in	Shaft Extension	4.62 in
Assembly/Box Mounting	F1/F2 CAPABLE		
Connection Drawing	EE7308AA	Outline Drawing	SS620704-100

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	10.83	26.64	5.50	11.00	---	9.50	4.75	4.75	F1 OR F2	284T
200	12.68	28.14			9.50	11.00		5.50		284/286T





F2 VIEW



DRAWING REVISION	REVISION BY	REV DATE/© DATE
C	VS	27-10-2020
ECO	APPROVED BY	DATE
CR-0000305	GNK	27-10-2020

ECO DESCRIPTION
DRAWING UPDATED

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

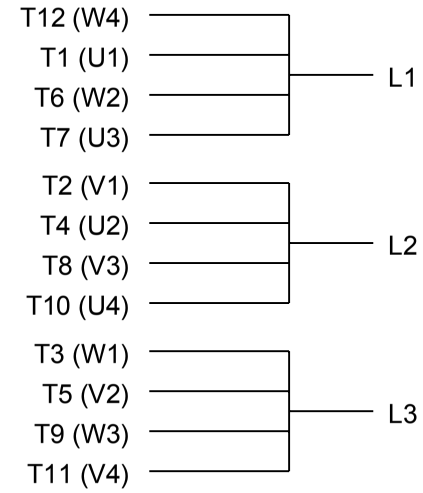
DRAWN BY	MR
DATE	4/5/2015
APPROVED BY	KRK
DATE	4/5/2015
REFERENCE	
THIRD ANGLE PROJECTION	

REGAL® Regal Beloit America, Inc.

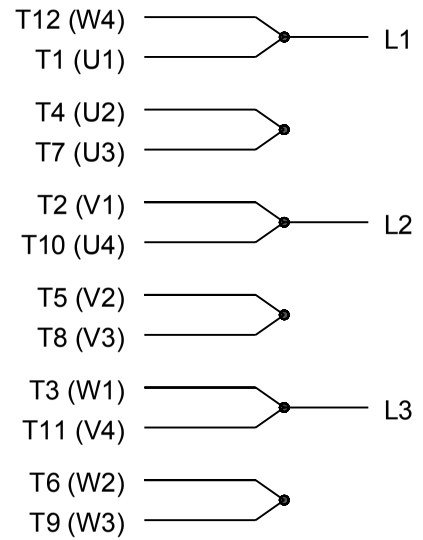
DESCRIPTION
OUTLINE
284/286T FR-TEFC-CAST IRON

MATERIAL | PROCESS/FINISH

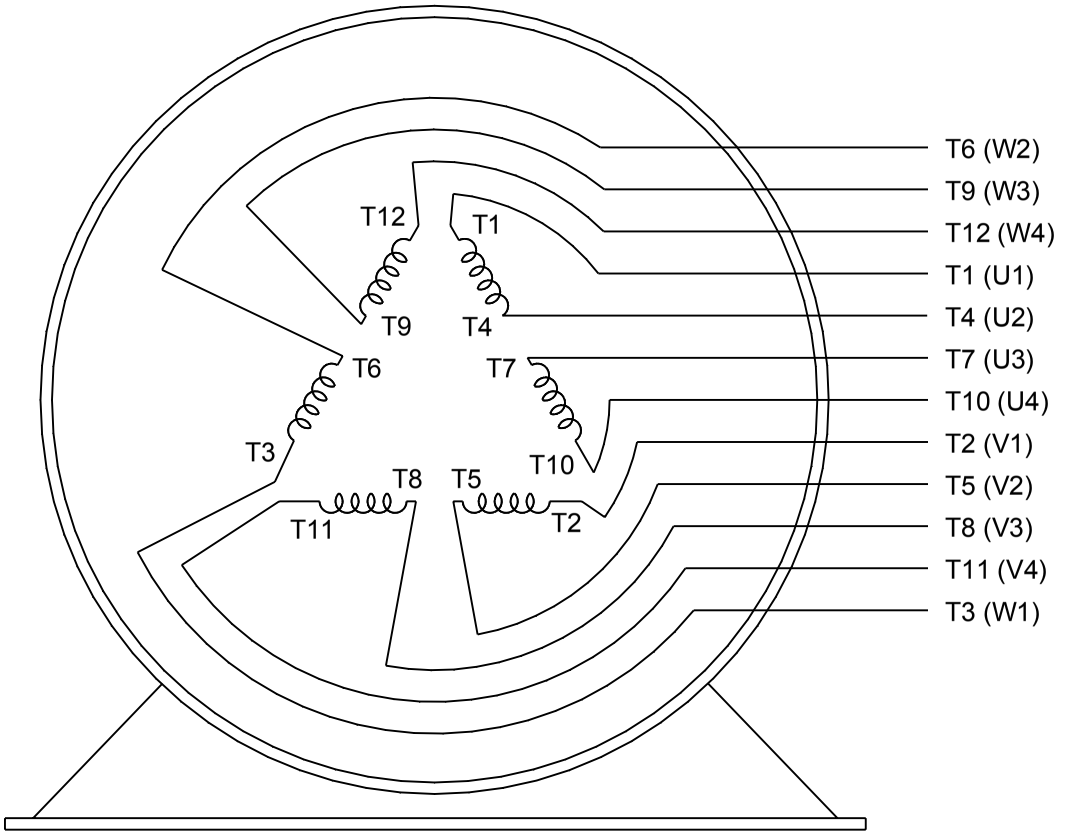
SIZE	DRAWING NUMBER	SHEET
B	SS620704	1 OF 1



LOW VOLTAGE



HIGH VOLTAGE



VIEW OF TERMINAL END

DRAWING REVISION: K	REVISION BY: AJW	DATE: 07-17-2015	DRAWN BY: LZ	Regal Beloit America, Inc.	
ECO: ECO-0081632	APPROVED BY: T. VUE	DATE: 07-17-2015	DATE: 01-12-1994		
ECO DESCRIPTION: REV'D IEC MARKINGS PER IEC 60034-8			APPROVED BY: GK	DESCRIPTION: CONN DIAGRAM-EXTERNAL	
			DATE: 01-14-1994	3Ø-2/1 DELTA-12 LEADS	
			REFERENCE	MATERIAL	PROCESS/FINISH
			THIRD ANGLE PROJECTION	SIZE: A	DRAWING NUMBER: EE7308AA / SHEET: 1 OF 1

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 284TTFCD6026 BB

CONN. DIAGRAM: A-EE7308AA

CUSTOMER PART #:

OUTLINE: SS620704-284

MOUNTING: F1/F2 CAPABLE

WINDING #: HE31804007 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
25&20	18.7&14.9	1800	1775&1476	284T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	61/30.5&60/30	Y START D RUN OR INV	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	93.6&93	3/4 LOAD EFF:	93.6	1/2 LOAD EFF:	93	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	83&81.5	3/4 LOAD PF:	77.5	1/2 LOAD PF:	66.5	93	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
74 LB-FT	364 / 182	144 LB-FT 195 %	192 LB-FT 260 %	55

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
75 dBA	85 dBA	5.2 LB-FT^2	175 LB-FT^2	20 SEC.	2	400 LBS.

***** SUPPLEMENTAL INFORMATION *****

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6311	6211						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

*

N

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INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:21:07 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 7/16/2020
Customer:
Attention:
Submitted by:

284TTFCD6026

Submittal

Data @ 460 **V**

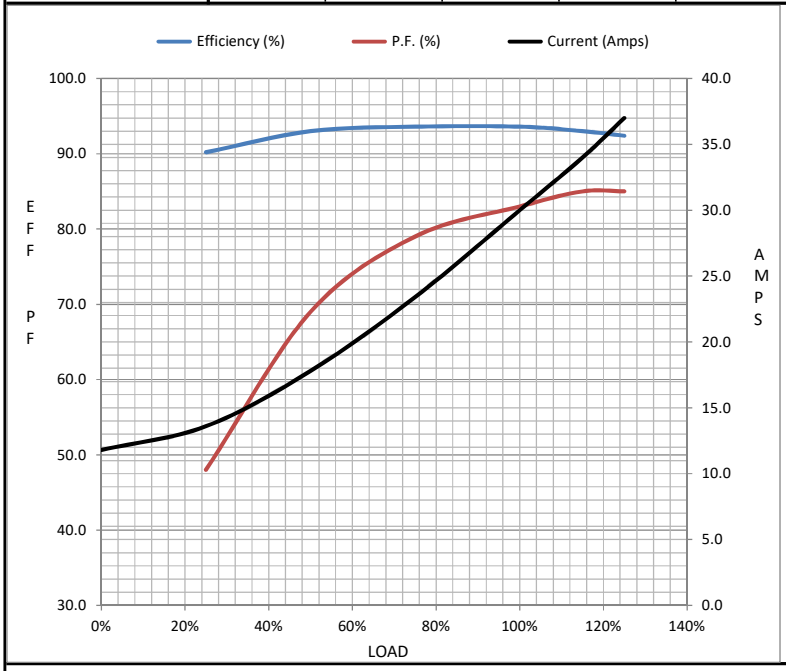
marathon® Motors

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	11.8	13.6	17.8	23.4	30.0	34.0	37.0	182	
Torque (ft-lb)	0.00	18.3	36.7	55.2	74.0	85.2	93.0	144	
RPM	1800	1795	1788	1782	1772	1,768	1765	0	
Efficiency (%)		90.2	93.0	93.6	93.6	93.0	92.4		
P.F. (%)	4.5	48.0	69.0	79.0	83.0	85.0	85.0	36.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1650	1772	1800
Current (Amps)	182	150	110	30.0	11.8
Torque (ft-lb)	144	118	190	74.0	0.00

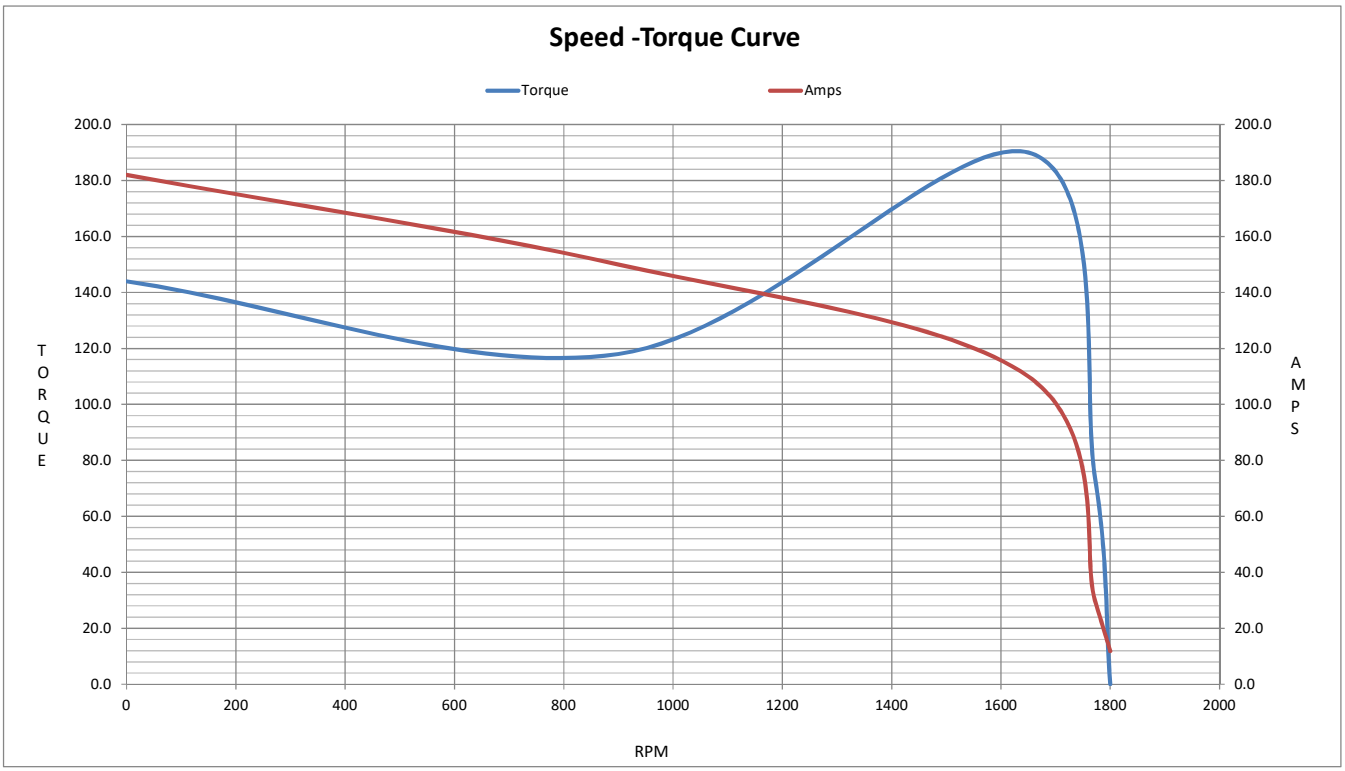


Information Block

HP	25.0
Sync. RPM	1800
Frame	284
Enclosure	TEFC
Construction	TFC
Voltage	208-230/460#190/380 V
Frequency	60 Hz
Design	B
LR Code letter	G
Service Factor	1.15
Temp Rise @ FL	60 ° C
Duty	CONT
Ambient	40 ° C
Elevation	3,300 feet
Rotor/Shaft wk²	5.2 Lb-Ft²
Ref Wdg	HA31804014 NONE
Sound Pressure @ 1M	75 dBA
VFD Rating	CONSTANT 10:1/VARIABLE 10:1
Outline Dwg	037898-912
Conn. Diag	EE7308AA
Additional Specifications:	
0	
0	

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.2000	0.1250	0.7420	0.9720	19.4360



PRODUCT INFORMATION PACKET

Model No: 286TTFCD6026
Catalog No: GT1031A
30 HP General Purpose Motor, 3 phase, 1800 RPM, 208-230/460 V, 286T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

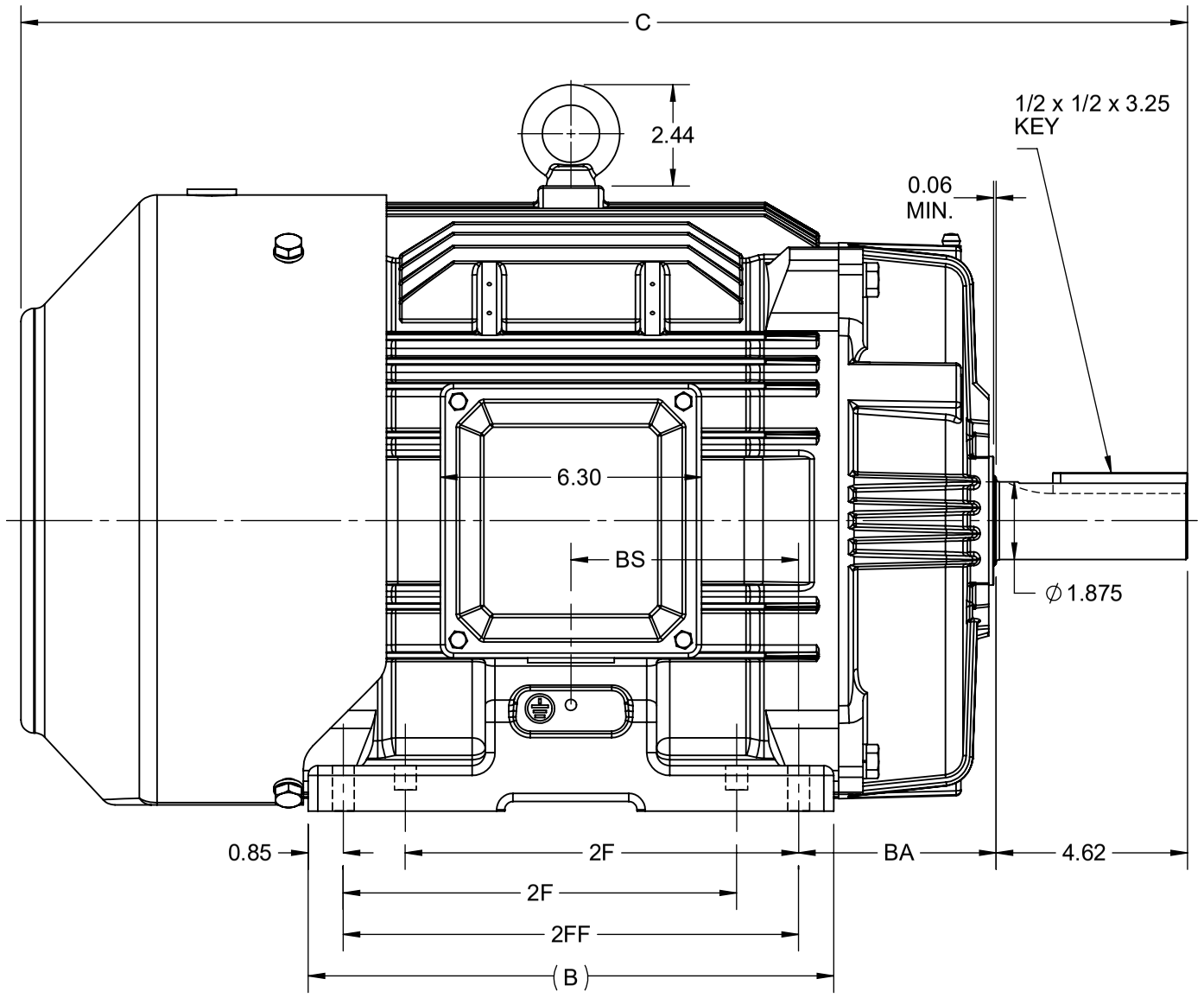
Nameplate Specifications

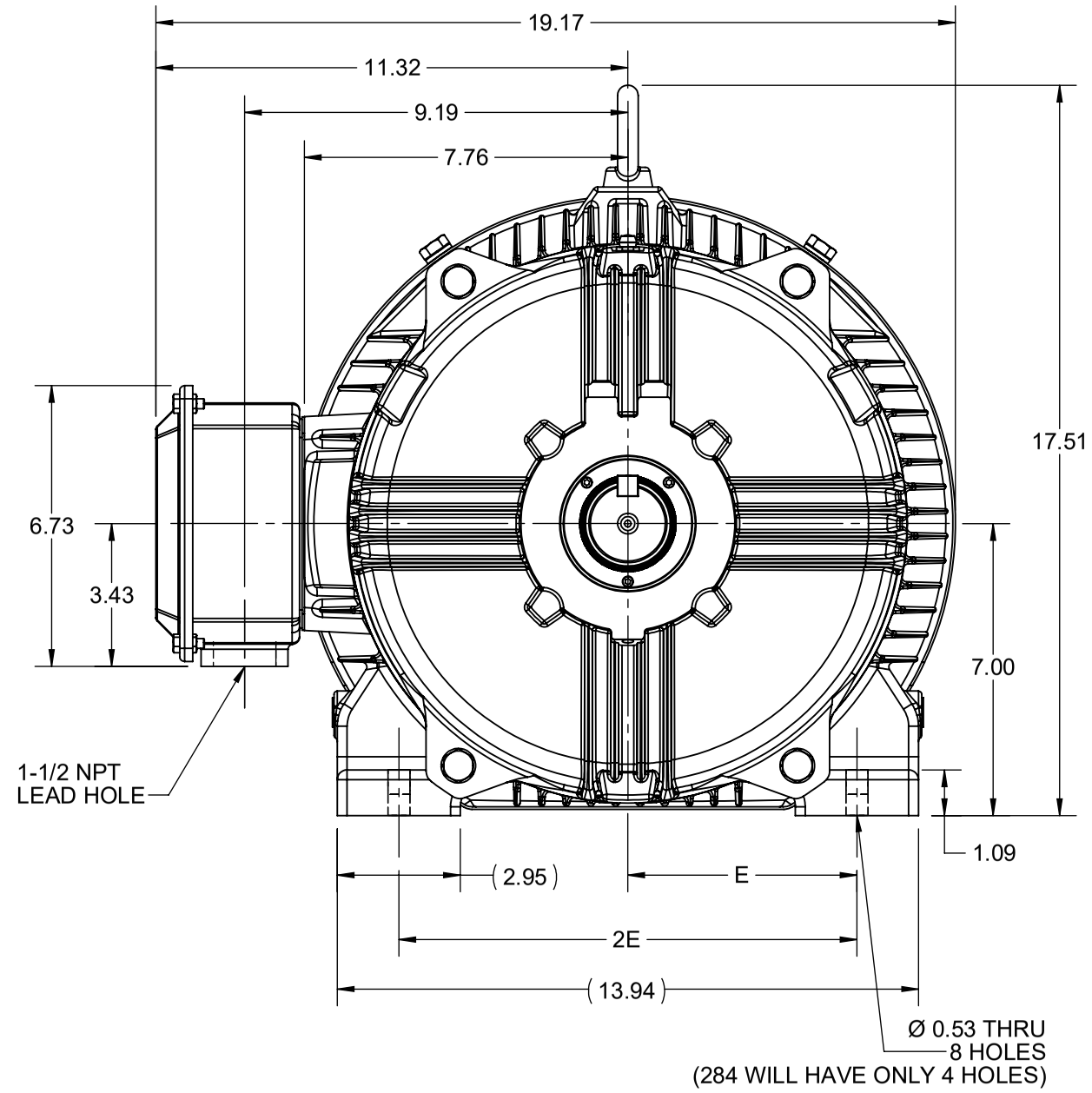
Output HP	30 Hp	Output KW	22.4 kW
Frequency	60 Hz	Voltage	208-230/460 V
Current	78.0-71.0/35.5 A	Speed	1770 rpm
Service Factor	1.15	Phase	3
Efficiency	93.6 %	Power Factor	84
Duty	Continuous	Insulation Class	F
Design Code	B	KVA Code	G
Frame	286T	Enclosure	Totally Enclosed Fan Cooled
Thermal Protection	No	Ambient Temperature	40 °C
Drive End Bearing Size	6311	Opp Drive End Bearing Size	6211
UL	Listed	CSA	Y
CE	Y	IP Code	55
Hazardous Location	DIVISION 2 T2B		

Technical Specifications

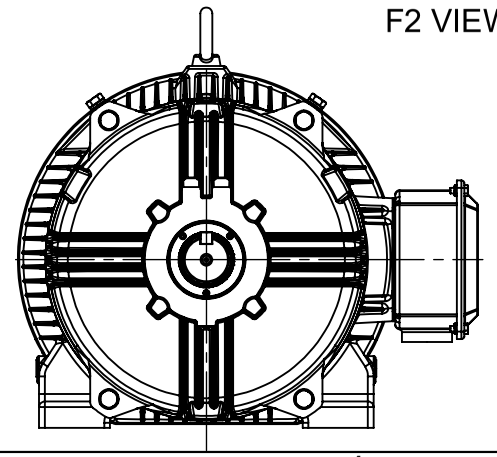
Electrical Type	Squirrel Cage Inverter Rated	Starting Method	Part Wdg Start Low Volt Only & Wye Start Delta Run Or Inverter
Poles	4	Rotation	Selective Clockwise
Resistance Main	.27 Ohms	Mounting	Rigid Base
Motor Orientation	Horizontal	Drive End Bearing	Ball
Opp Drive End Bearing	Ball	Frame Material	Cast Iron
Shaft Type	T	Overall Length	28.14 in
Shaft Diameter	1.875 in	Shaft Extension	4.62 in
Assembly/Box Mounting	F1/F2 CAPABLE		
Outline Drawing	SS620704-200	Connection Drawing	EE7308AA

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	10.83	26.64	5.50	11.00	---	9.50	4.75	4.75	F1 OR F2	284T
200	12.68	28.14			9.50	11.00		5.50		284/286T





F2 VIEW



DRAWING REVISION	REVISION BY	REV DATE/© DATE
C	VS	27-10-2020
ECO	APPROVED BY	DATE
CR-0000305	GNK	27-10-2020

ECO DESCRIPTION
DRAWING UPDATED

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

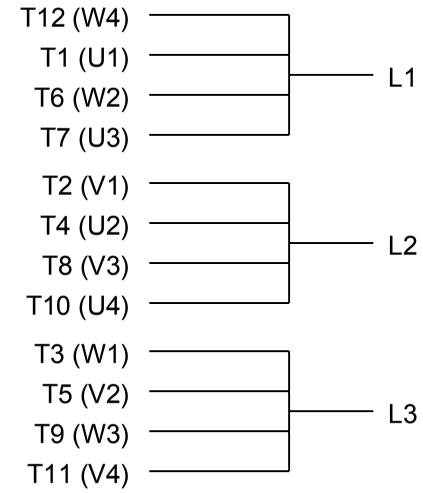
DRAWN BY	MR
DATE	4/5/2015
APPROVED BY	KRK
DATE	4/5/2015
REFERENCE	
THIRD ANGLE PROJECTION	

REGAL® Regal Beloit America, Inc.

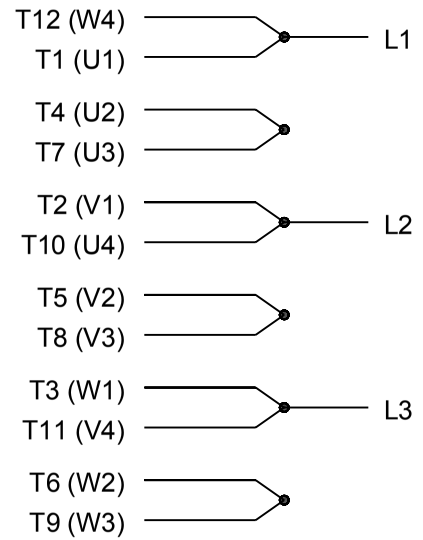
DESCRIPTION
OUTLINE
284/286T FR-TEFC-CAST IRON

MATERIAL | PROCESS/FINISH

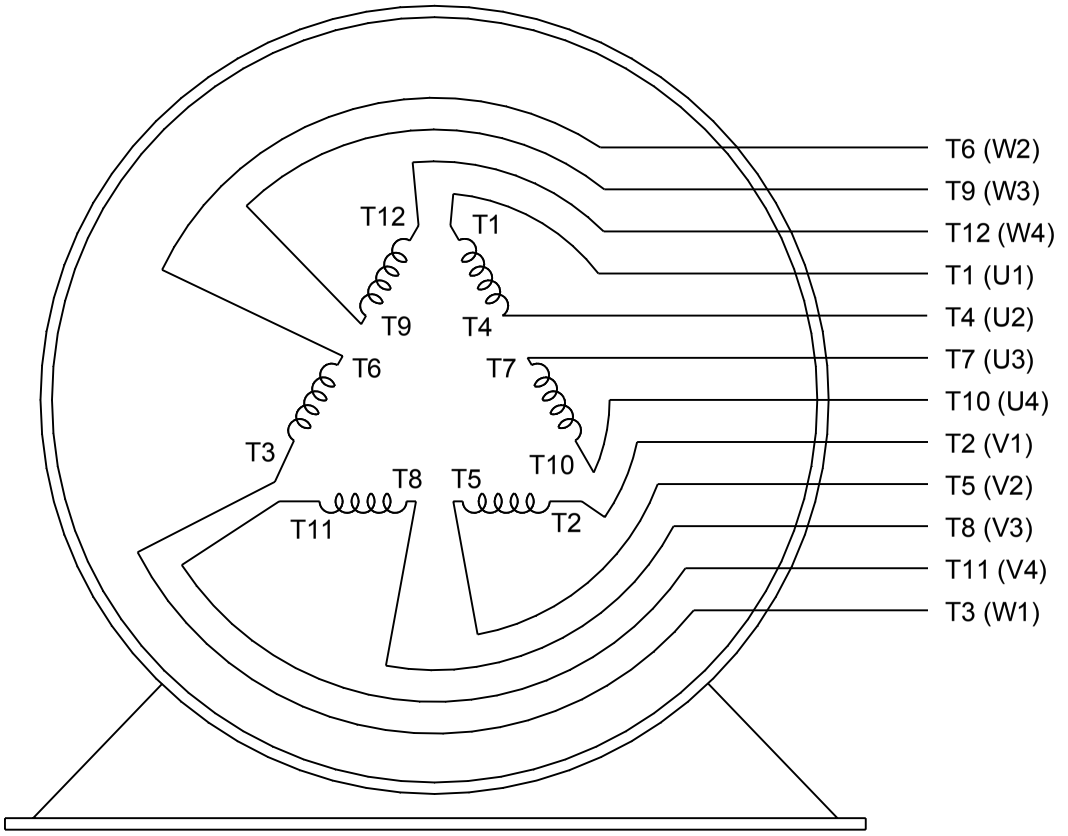
SIZE	DRAWING NUMBER	SHEET
B	SS620704	1 OF 1



LOW VOLTAGE



HIGH VOLTAGE



VIEW OF TERMINAL END

DRAWING REVISION: K	REVISION BY: AJW	DATE: 07-17-2015	DRAWN BY: LZ	Regal Beloit America, Inc.	
ECO: ECO-0081632	APPROVED BY: T. VUE	DATE: 07-17-2015	DATE: 01-12-1994		
ECO DESCRIPTION: REV'D IEC MARKINGS PER IEC 60034-8			APPROVED BY: GK	DESCRIPTION: CONN DIAGRAM-EXTERNAL	
			DATE: 01-14-1994	3Ø-2/1 DELTA-12 LEADS	
			REFERENCE	MATERIAL	PROCESS/FINISH
			THIRD ANGLE PROJECTION	SIZE: A	DRAWING NUMBER: EE7308AA / SHEET: 1 OF 1

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 286TTFCD6026 BB

CONN. DIAGRAM: A-EE7308AA

CUSTOMER PART #:

OUTLINE: SS620704-286

MOUNTING: F1/F2 CAPABLE

WINDING #: HE31804006 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
30&25	22.4&18.7	1800	1775&1475	286T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	72.5/36.5&73/36.5	Y START D RUN OR INV	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	93.6&93	3/4 LOAD EFF:	93.6	1/2 LOAD EFF:	93	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	83&84	3/4 LOAD PF:	78	1/2 LOAD PF:	67.5	93	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
89 LB-FT	434 / 217	178 LB-FT 200 %	227 LB-FT 255 %	65

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
68 dBA	78 dBA	5.7 LB-FT^2	225 LB-FT^2	20 SEC.	2	492 LBS.

***** SUPPLEMENTAL INFORMATION *****

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6311	6211						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

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INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:38:34 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 7/16/2020
Customer:
Attention:
Submitted by:

286TTFCD6026

Submittal

Data @ 460 **V**

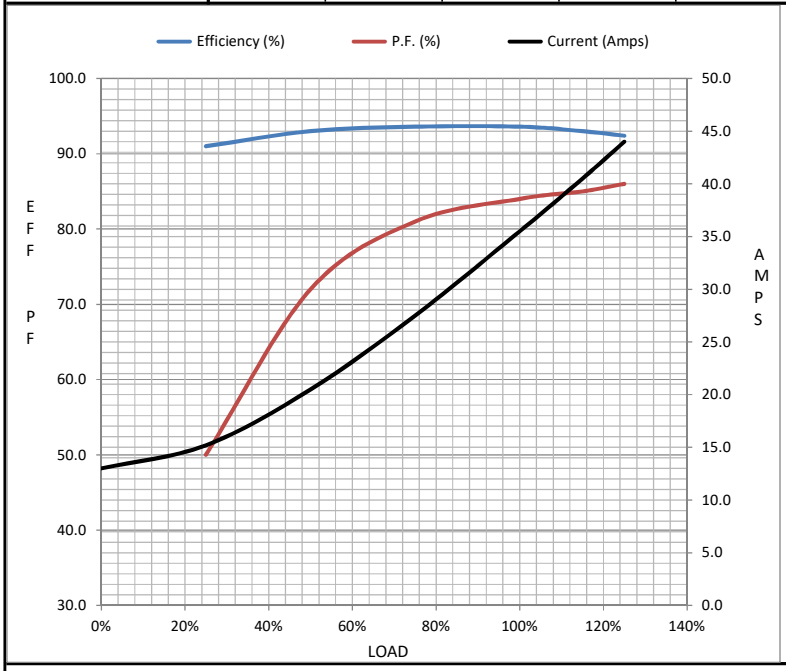
marathon® Motors

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	13.0	15.2	20.5	27.5	35.5	40.5	44.0	215	
Torque (ft-lb)	0.00	22.0	44.0	66.5	89.0	103	112	169	
RPM	1800	1792	1785	1780	1770	1,765	1762	0	
Efficiency (%)		91.0	93.0	93.6	93.6	93.0	92.4		
P.F. (%)	4.5	50.0	72.0	81.0	84.0	85.0	86.0	36.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1650	1770	1800
Current (Amps)	215	180	129	35.5	13.0
Torque (ft-lb)	169	145	235	89.0	0.00

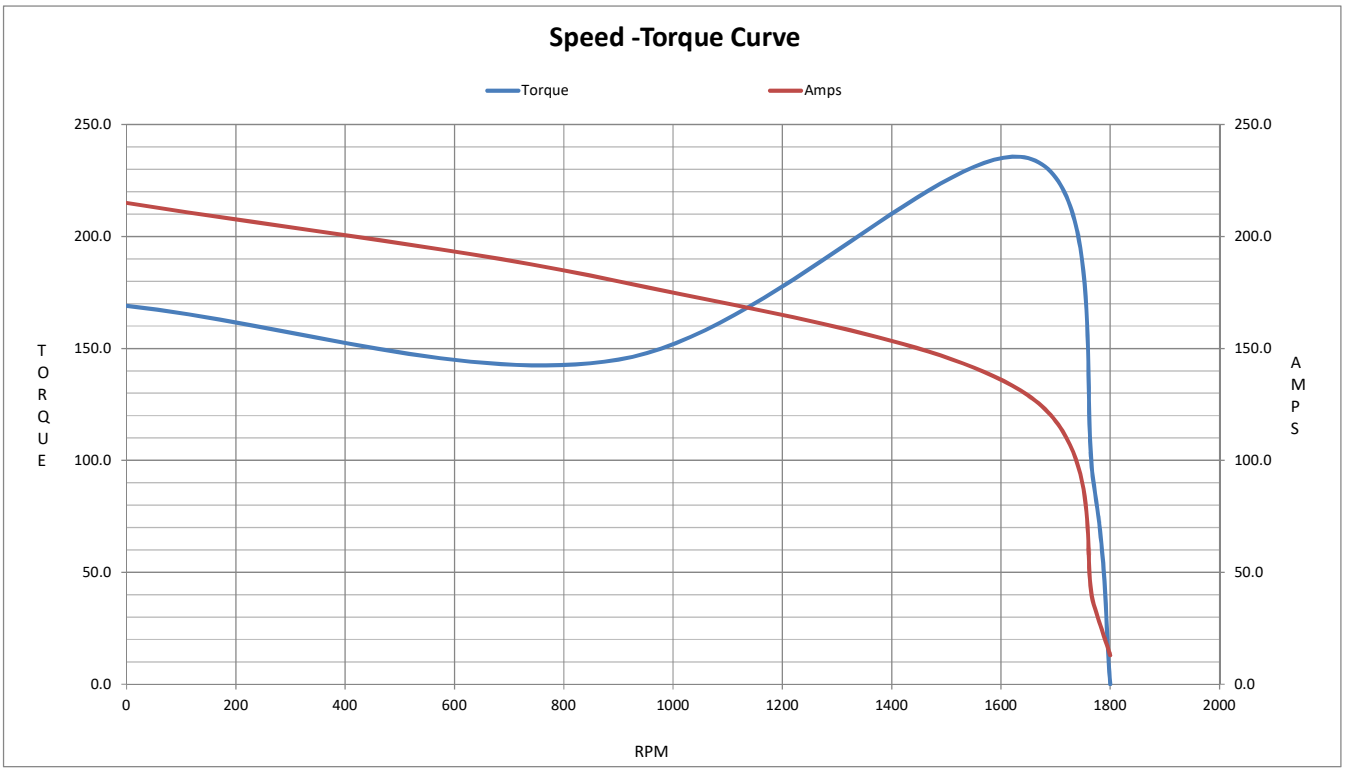


Information Block

HP	30.0
Sync. RPM	1800
Frame	286
Enclosure	TEFC
Construction	TFC
Voltage	208-230/460#190/380 V
Frequency	60 Hz
Design	B
LR Code letter	G
Service Factor	1.15
Temp Rise @ FL	65 ° C
Duty	CONT
Ambient	40 ° C
Elevation	3,300 feet
Rotor/Shaft wk²	5.7 Lb-Ft²
Ref Wdg	HA31804013 NONE
Sound Pressure @ 1M	75 dBA
VFD Rating	CONSTANT 10:1/VARIABLE 10:1
Outline Dwg	037898-912
Conn. Diag	EE7308AA
Additional Specifications:	
0	
0	

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.1750	0.1250	0.6710	0.9400	20.3180



PRODUCT INFORMATION PACKET

Model No: 324TTFCD6026
Catalog No: GT1034A
40 HP General Purpose Motor, 3 phase, 1800 RPM, 230/460 V, 324T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

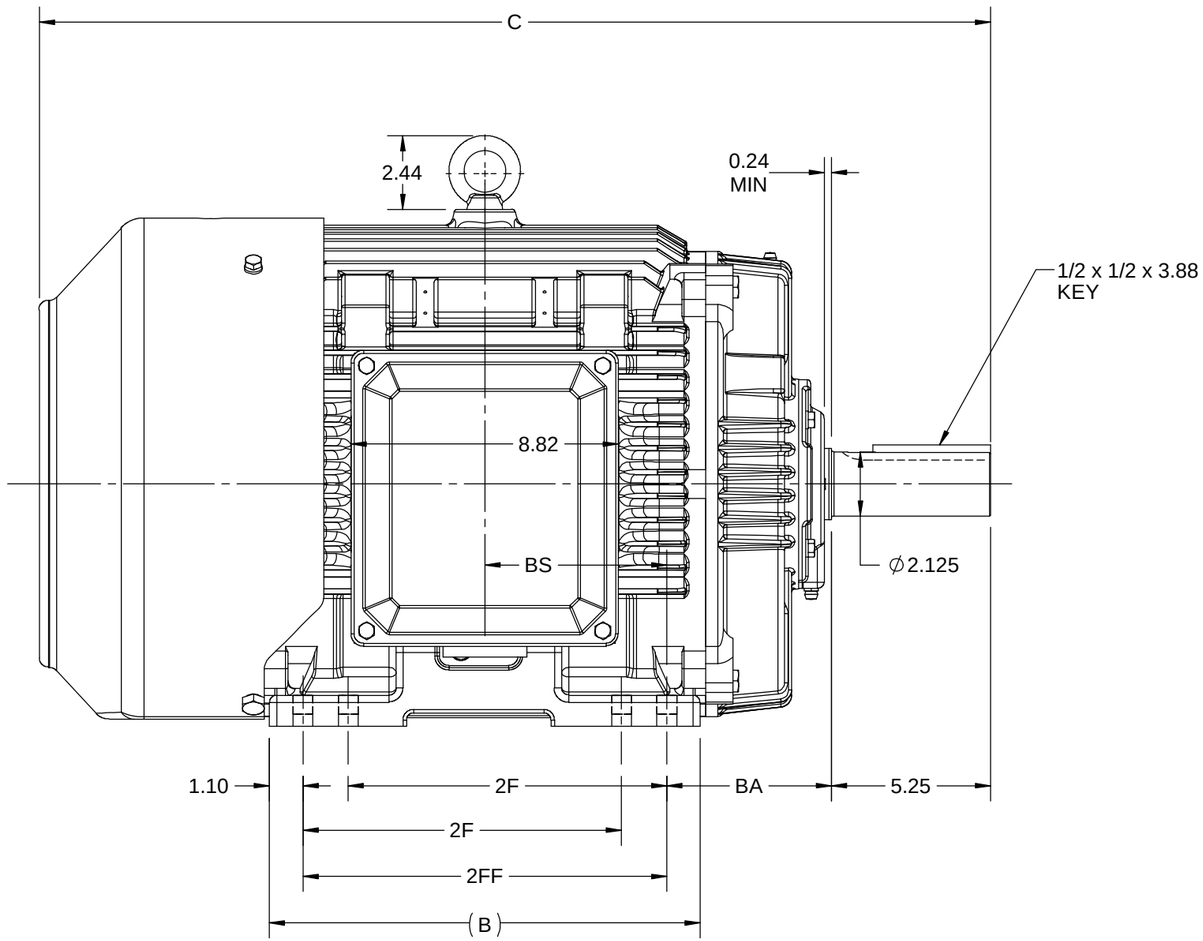
Nameplate Specifications

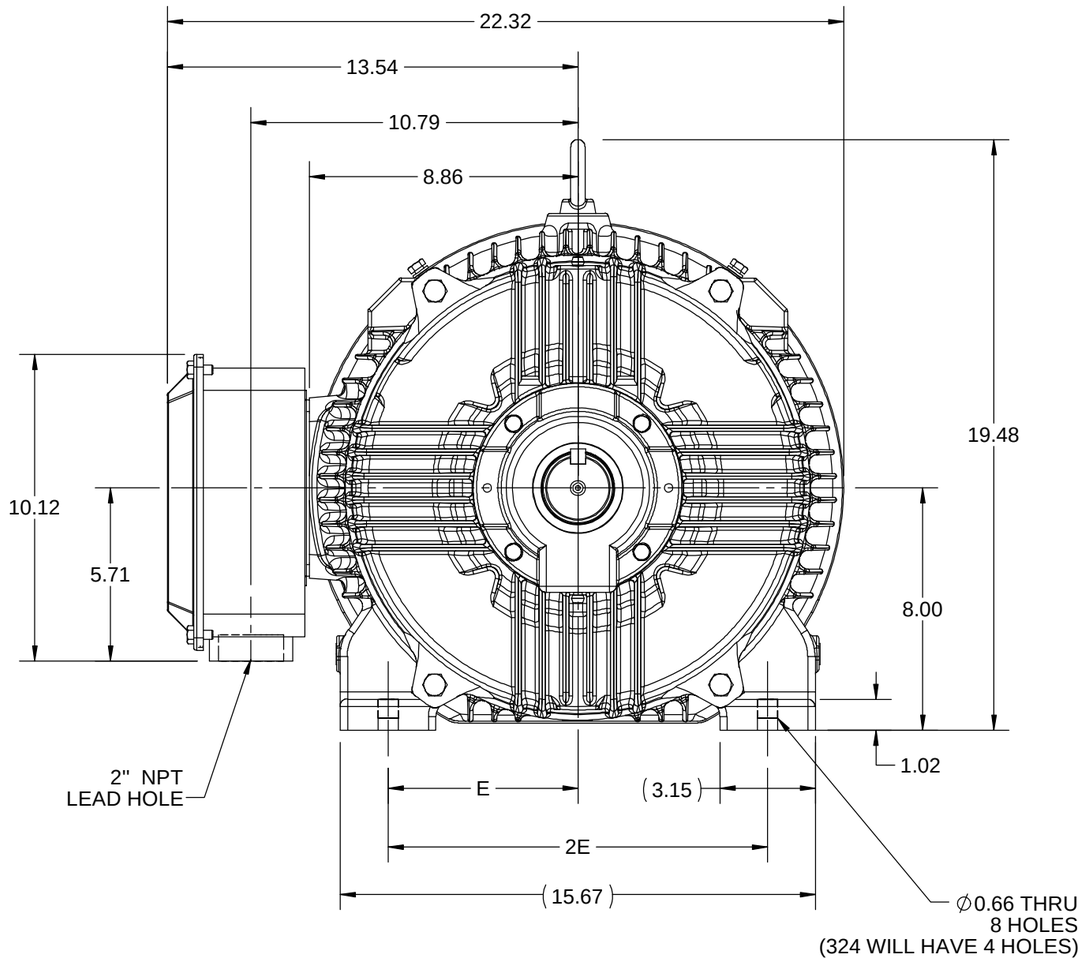
Output HP	40 Hp	Output KW	30.0 kW
Frequency	60 Hz	Voltage	230/460 V
Current	95.0/47.5 A	Speed	1782 rpm
Service Factor	1.15	Phase	3
Efficiency	94.1 %	Power Factor	84
Duty	Continuous	Insulation Class	F
Design Code	B	KVA Code	G
Frame	324T	Enclosure	Totally Enclosed Fan Cooled
Thermal Protection	No	Ambient Temperature	40 °C
Drive End Bearing Size	6312	Opp Drive End Bearing Size	6212
UL	Listed	CSA	Y
CE	Y	IP Code	55
Hazardous Location	DIVISION 2 T2B		

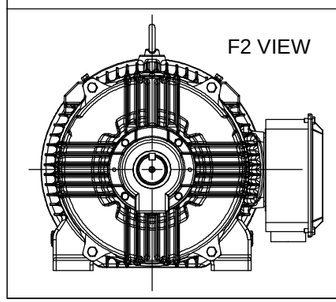
Technical Specifications

Electrical Type	Squirrel Cage Inverter Rated	Starting Method	Part Wdg Start Low Volt Only & Wye Start Delta Run Or Inverter
Poles	4	Rotation	Selective Clockwise
Resistance Main	.18 Ohms	Mounting	Rigid Base
Motor Orientation	Horizontal	Drive End Bearing	Ball
Opp Drive End Bearing	Ball	Frame Material	Cast Iron
Shaft Type	T	Overall Length	29.69 in
Shaft Diameter	2.125 in	Shaft Extension	5.25 in
Assembly/Box Mounting	F1/F2 CAPABLE		
Connection Drawing	EE7358	Outline Drawing	SS312782-100

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	12.71	29.69	6.25	12.50	---	10.50	5.25	5.25	F1 OR F2	324T
200	14.21	31.19			10.50	12.00		6.00		324/326T







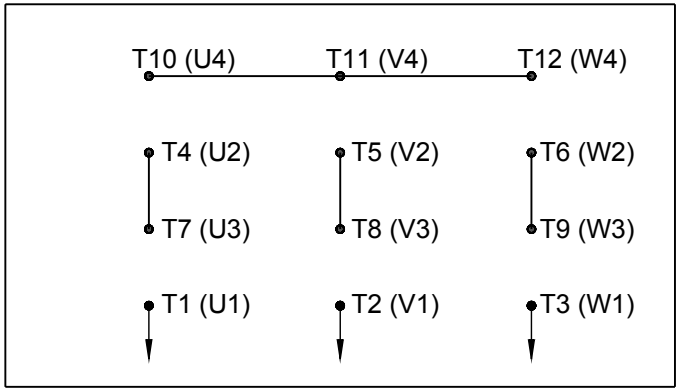
DRAWING REVISION C	REVISION BY ASHOK N	REV DATE/© DATE 14/10/2020
ECO ECO-0194008	APPROVED BY GNK	DATE 14/10/2020
ECO DESCRIPTION DRAWING UPDATED		

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

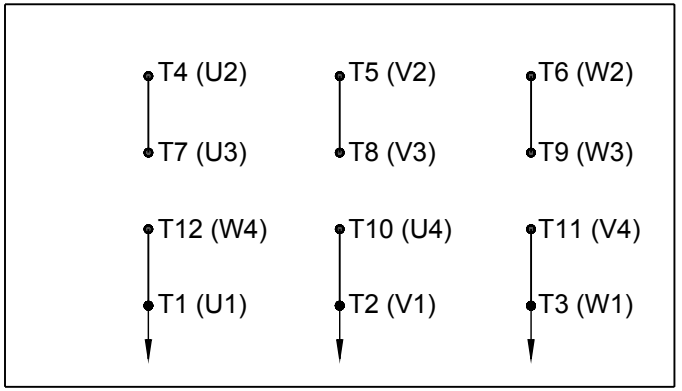
DRAWN BY NIV	REGAL® Regal Beloit America, Inc.	
DATE 25/03/2016		
APPROVED BY SBD	DESCRIPTION OUTLINE 324/326T FR-NEMA-TEFC	
DATE 25/03/2016		
REFERENCE	MATERIAL	PROCESS/FINISH
THIRD ANGLE PROJECTION	SIZE B / DRAWING NUMBER SS312782	SHEET 1 OF 1

HIGH VOLTAGE

WYE START

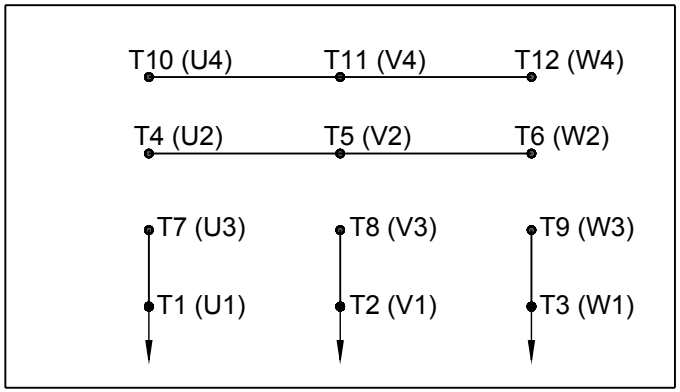


DELTA RUN

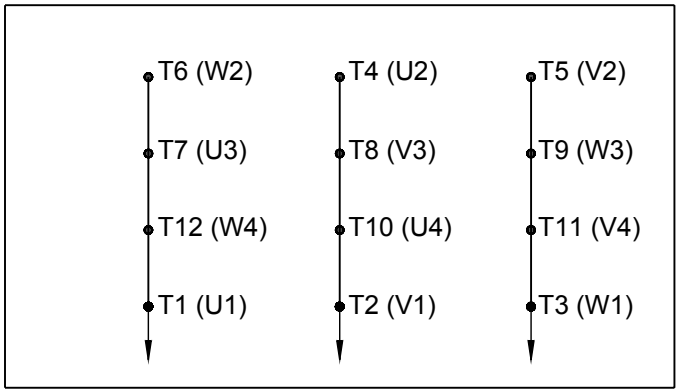


LOW VOLTAGE

WYE START



DELTA RUN



4/2 CKTY △

DRAWING REVISION: D	REVISION BY: JWO	DATE: 01-26-2016		DRAWN BY: BLR	Regal Beloit America, Inc.
ECO: ECO-0092547	APPROVED BY: TB	DATE: 01-26-2016		DATE: 03-09-1998	
ECO DESCRIPTION: ADDED IEC MARKINGS				APPROVED BY: GK	DESCRIPTION: CONN DIAGRAM-EXTERNAL 12 LEAD - DUAL VOLT. - WYE START - DELTA RUN
				DATE: 03-23-1998	
				REFERENCE	MATERIAL / PROCESS/FINISH
				THIRD ANGLE PROJECTION	SIZE: A / DRAWING NUMBER: EE7358 / SHEET: 1 OF 1

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 324TTFCD6026 BB

CONN. DIAGRAM: EE7308AA

CUSTOMER PART #:

OUTLINE: SS312782-324T

MOUNTING: F1/F2 CAPABLE

WINDING #: HE32004007 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
40&30	30.0&22.4	1800	1782&1485	324T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	95/47.5&86/43	Y START D RUN OR INV	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	94.1&93.9	3/4 LOAD EFF:	94.1	1/2 LOAD EFF:	93.6	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	84&84	3/4 LOAD PF:	81	1/2 LOAD PF:	72.5	93.6	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
118 LB-FT	580 / 290	212 LB-FT 180 %	313 LB-FT 265 %	55

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
60 dBA	70 dBA	11.2 LB-FT^2	- LB-FT^2	20 SEC.	2	625 LBS.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6312	6212						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

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INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:20:44 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 12/14/2018
Customer:
Attention:
Submitted by: FAREEDA DUDEKULA

marathon® electric

324TTFCD6026

Submittal

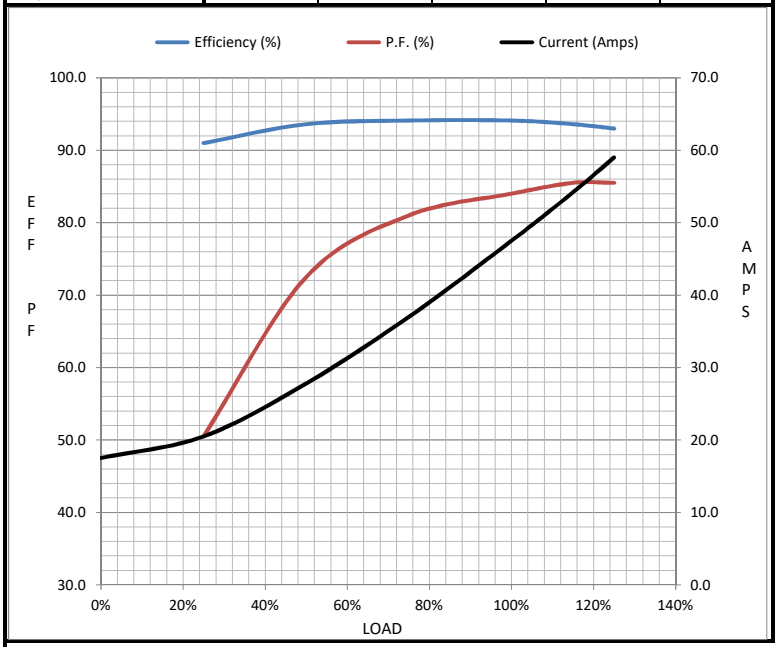
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	17.5	20.5	27.8	37.0	47.5	54.2	59.0	290	
Torque (ft-lb)	0.00	29.3	58.5	88.3	118	136	149	212	
RPM	1800	1795	1790	1788	1782	1,780	1778	0	
Efficiency (%)		91.0	93.6	94.1	94.1	93.6	93.0		
P.F. (%)	5.0	50.5	72.5	81.0	84.0	85.5	85.5	32.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1710	1782	1800
Current (Amps)	290	230	170	47.5	17.5
Torque (ft-lb)	212	180	313	118	0.00

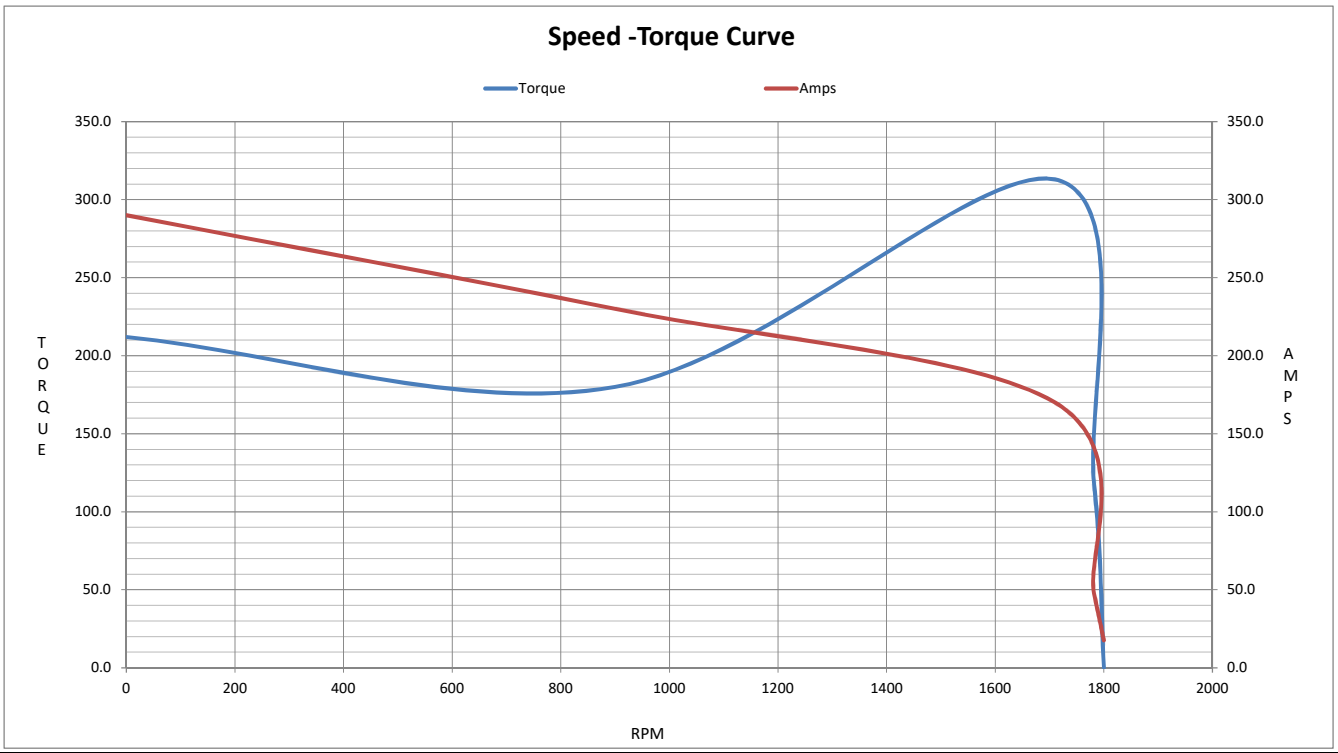


Information Block

HP	40.0	
Sync. RPM	1800	
Frame	324	
Enclosure	TEFC	
Construction	TFC	
Voltage	230/460#190/380	V
Frequency	60	Hz
Design	B	
LR Code letter	G	
Service Factor	1.15	
Temp Rise @ FL	55	° C
Duty	CONT	
Ambient	40	° C
Elevation	1,000	feet
Rotor/Shaft wk²	11.2	Lb-Ft²
Ref Wdg	HE32004007 NONE	
Sound Pressure @ 1M	60	dBA
VFD Rating	VARIABLE 10:1	
Outline Dwg	SS312782	
Conn. Diag	EE7308AA	
Additional Specifications:		
0		
0		

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.1130	0.0610	0.4680	0.8300	15.3850



PRODUCT INFORMATION PACKET

Model No: 326TTFCD6026
Catalog No: GT1037A
50 HP General Purpose Motor, 3 phase, 1800 RPM, 230/460 V, 326T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

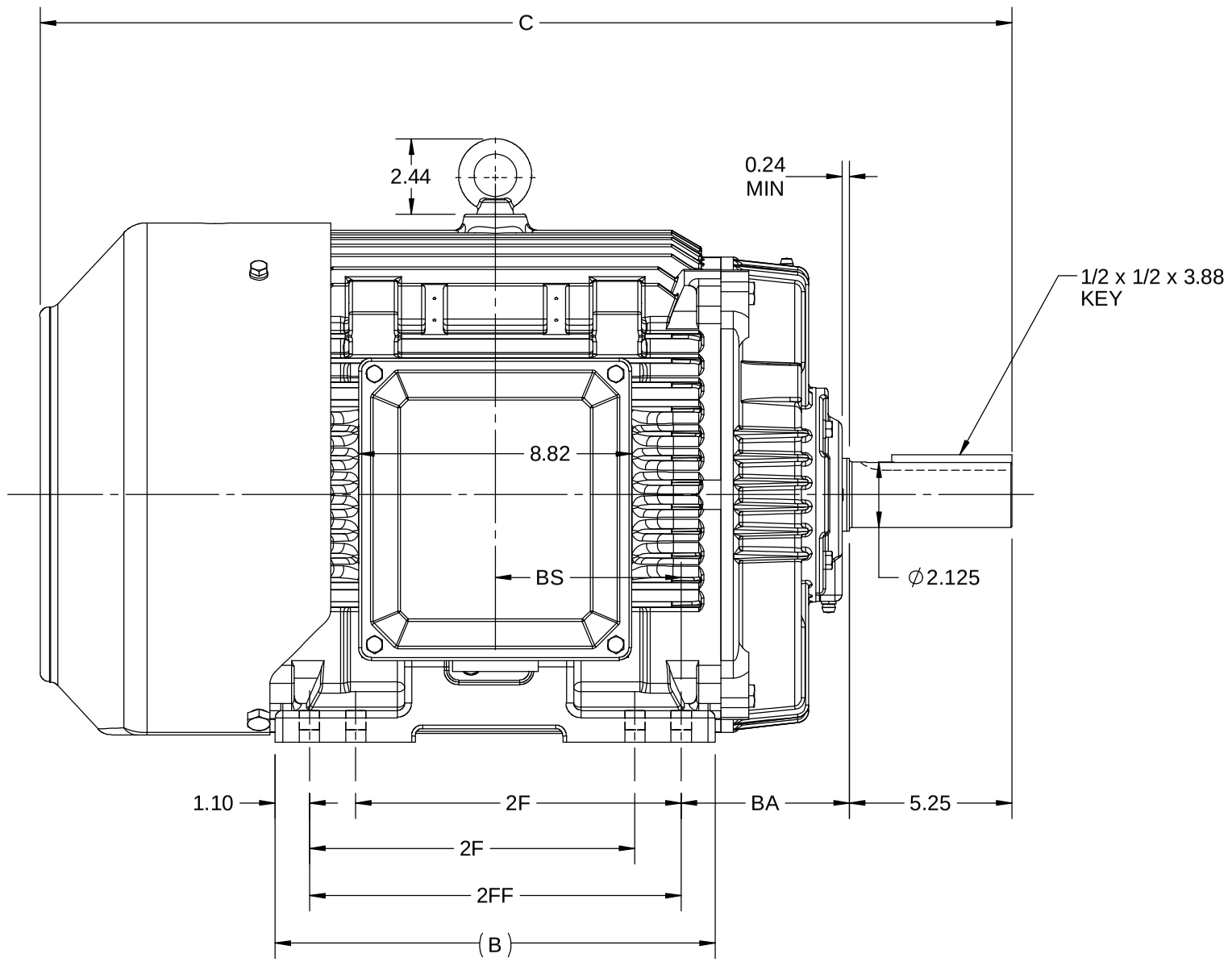
Nameplate Specifications

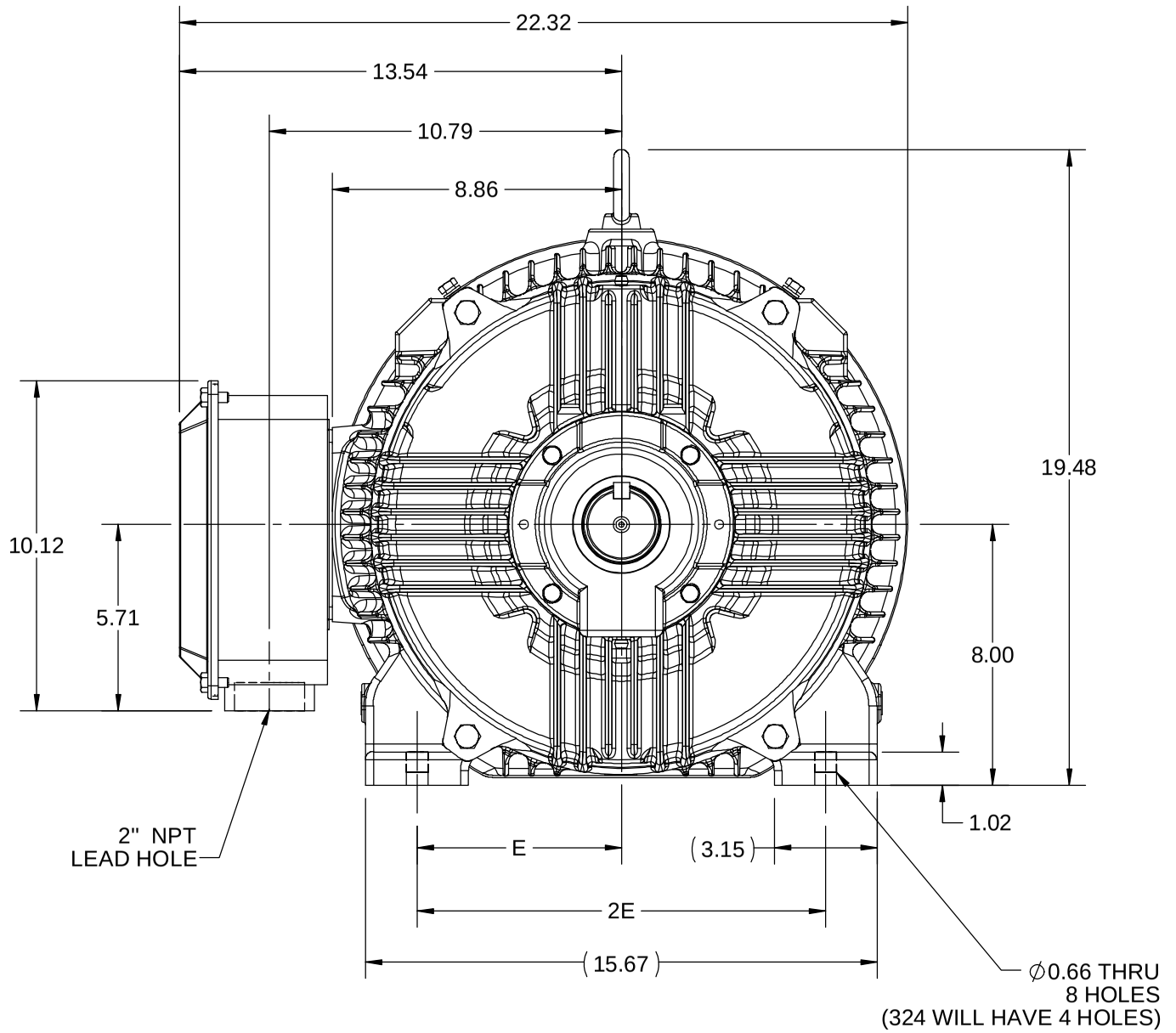
Output HP	50 Hp	Output KW	37.0 kW
Frequency	60 Hz	Voltage	230/460 V
Current	117.0/58.5 A	Speed	1782 rpm
Service Factor	1.15	Phase	3
Efficiency	94.5 %	Power Factor	85
Duty	Continuous	Insulation Class	F
Design Code	B	KVA Code	G
Frame	326T	Enclosure	Totally Enclosed Fan Cooled
Thermal Protection	No	Ambient Temperature	40 °C
Drive End Bearing Size	6312	Opp Drive End Bearing Size	6212
UL	Listed	CSA	Y
CE	Y	IP Code	55
Hazardous Location	DIVISION 2 T2B		

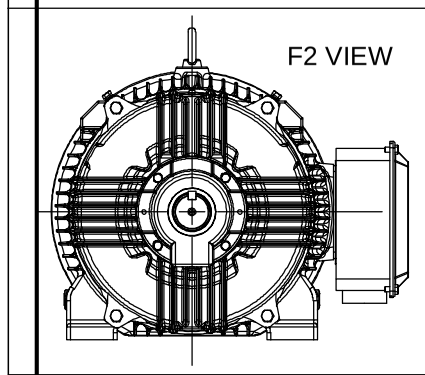
Technical Specifications

Electrical Type	Squirrel Cage Inverter Rated	Starting Method	Part Wdg Start Low Volt Only & Wye Start Delta Run Or Inverter
Poles	4	Rotation	Selective Clockwise
Resistance Main	.127 Ohms	Mounting	Rigid Base
Motor Orientation	Horizontal	Drive End Bearing	Ball
Opp Drive End Bearing	Ball	Frame Material	Cast Iron
Shaft Type	T	Overall Length	31.19 in
Shaft Diameter	2.125 in	Shaft Extension	5.25 in
Assembly/Box Mounting	F1/F2 CAPABLE		
Connection Drawing	EE7308AA	Outline Drawing	SS312782-200

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	12.71	29.69	6.25	12.50	---	10.50	5.25	5.25	F1 OR F2	324T
200	14.21	31.19			10.50	12.00		6.00		324/326T



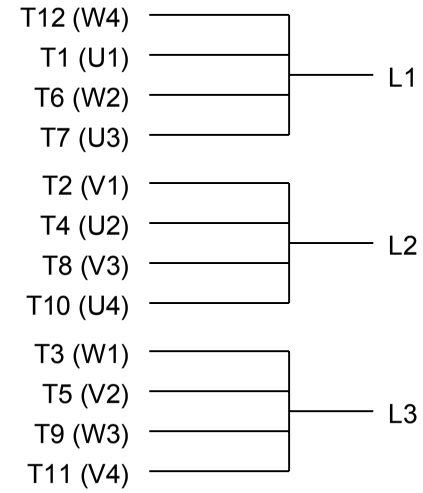




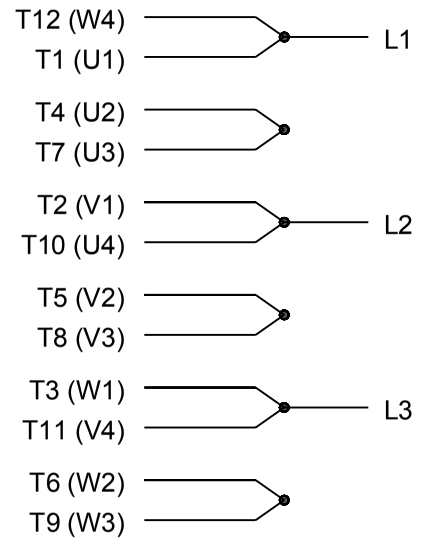
DRAWING REVISION: C	REVISION BY: ASHOK N	REV DATE/© DATE: 14/10/2020
ECO: ECO-0194008	APPROVED BY: GNK	DATE: 14/10/2020
ECO DESCRIPTION: DRAWING UPDATED		

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

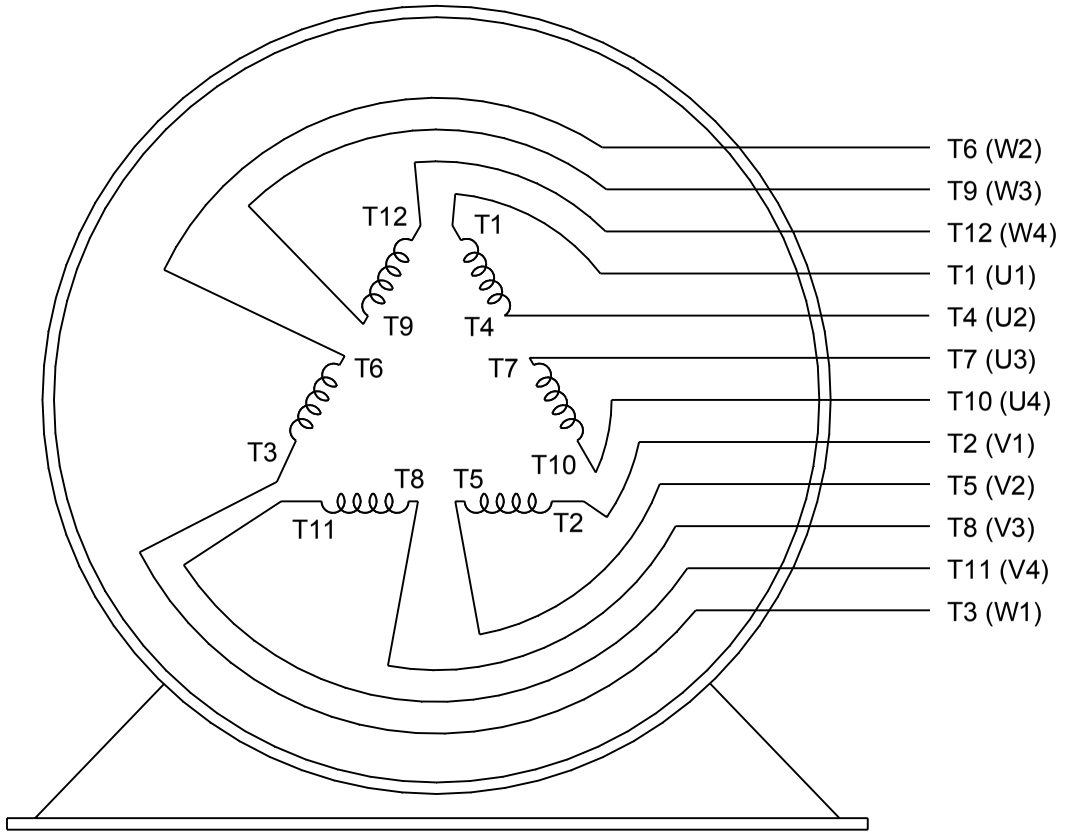
DRAWN BY: NIV	Regal Beloit America, Inc.		
DATE: 25/03/2016			
APPROVED BY: SBD	DESCRIPTION: OUTLINE 324/326T FR-NEMA-TEFC		
DATE: 25/03/2016			
REFERENCE	MATERIAL	PROCESS/FINISH	
THIRD ANGLE PROJECTION	SIZE: B	DRAWING NUMBER: SS312782	SHEET: 1 OF 1



LOW VOLTAGE



HIGH VOLTAGE



VIEW OF TERMINAL END

DRAWING REVISION: K	REVISION BY: AJW	DATE: 07-17-2015		DRAWN BY: LZ	Regal Beloit America, Inc.
ECO: ECO-0081632	APPROVED BY: T. VUE	DATE: 07-17-2015		DATE: 01-12-1994	
ECO DESCRIPTION: REV'D IEC MARKINGS PER IEC 60034-8				APPROVED BY: GK	DESCRIPTION: CONN DIAGRAM-EXTERNAL, 3Ø-2/1 DELTA-12 LEADS
				DATE: 01-14-1994	
				REFERENCE	MATERIAL / PROCESS/FINISH
				THIRD ANGLE PROJECTION	SIZE: A / DRAWING NUMBER: EE7308AA / SHEET: 1 OF 1

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 326TTFCD6026 BB

CONN. DIAGRAM: EE7308AA

CUSTOMER PART #:

OUTLINE: SS312782-326T

MOUNTING: F1/F2 CAPABLE

WINDING #: HE32004006 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
50&40	37.0&30.0	1800	1780&1475	326T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	117/58.5&115/57.5	Y START D RUN OR INV	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	94.5&94.1	3/4 LOAD EFF:	94.5	1/2 LOAD EFF:	94.1	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	85&85	3/4 LOAD PF:	82	1/2 LOAD PF:	73.8	94.1	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
147.5 LB-FT	724 / 362	275 LB-FT 180 %	395 LB-FT 260 %	65

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
65 dBA	75 dBA	12 LB-FT^2	- LB-FT^2	20 SEC.	2	680 LBS.

***** SUPPLEMENTAL INFORMATION *****

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6312	6212						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

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INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:39:53 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 19-06-2017
Customer:
Attention:
Submitted by: FAREEDA DUDEKULA

marathon® electric

326TTFCD6026

Submittal

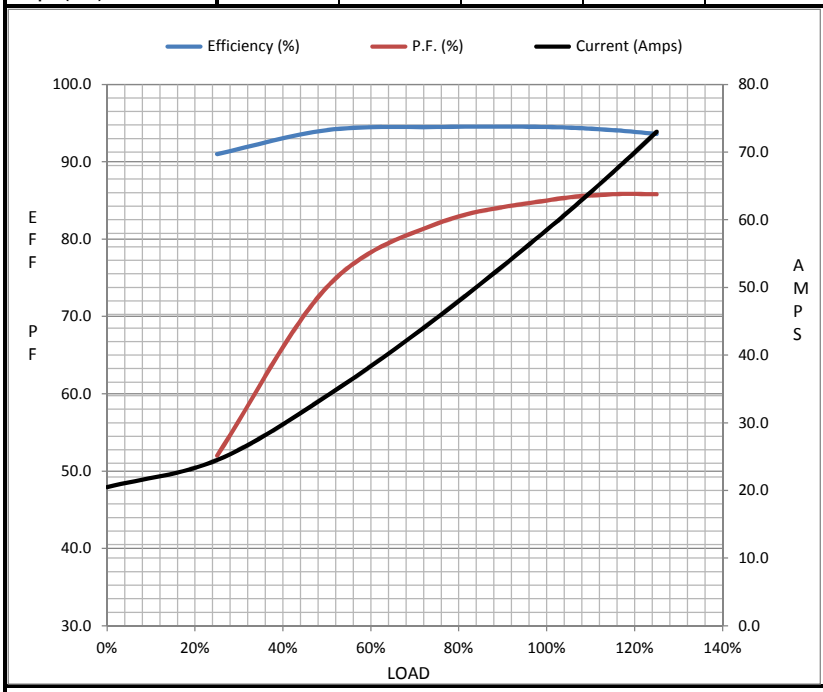
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	20.5	24.5	34.0	45.5	58.5	67.0	73.0	362	
Torque (ft-lb)	0.00	36.5	73.5	110	148	170	185	265	
RPM	1800	1795	1790	1788	1782	1,778	1775	0	
Efficiency (%)		91.0	94.1	94.5	94.5	94.1	93.6		
P.F. (%)	4.5	52.0	73.8	82.0	85.0	85.8	85.8	32.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1710	1782	1800
Current (Amps)	362	285	206	58.5	20.5
Torque (ft-lb)	265	225	383	148	0.00



Information Block

HP	50.0
Sync. RPM	1800
Frame	326
Enclosure	TEFC
Construction	TFC
Voltage	230/460#190/38(V
Frequency	60 Hz
Design	B
LR Code letter	G
Service Factor	1.15
Temp Rise @ FL	65 ° C
Duty	CONT
Ambient	40 ° C
Elevation	1,000 feet
Rotor/Shaft wk²	12.0 Lb-Ft²
Ref Wdg	HE32004006 NONE
Sound Pressure @ 1M	65 dBA
VFD Rating	VARIABLE 10:1
Outline Dwg	SS312782
Conn. Diag	EE7308AA

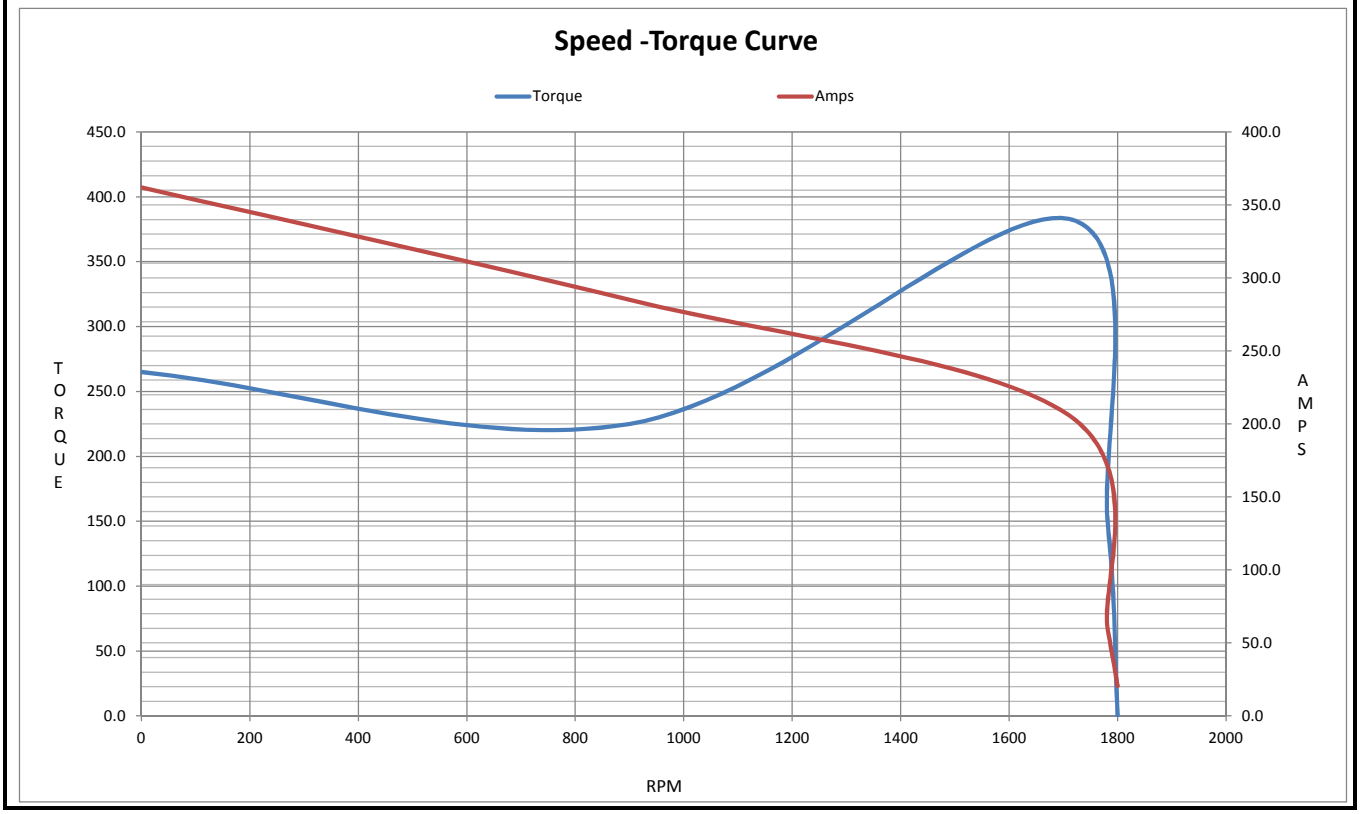
Additional Specifications:

0

365THFS8036

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0820	0.0490	0.3860	0.7030	13.0410



PRODUCT INFORMATION PACKET

Model No: 364TTFCD6036
Catalog No: GT1040A
60 HP General Purpose Motor, 3 phase, 1800 RPM, 230/460 V, 364T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

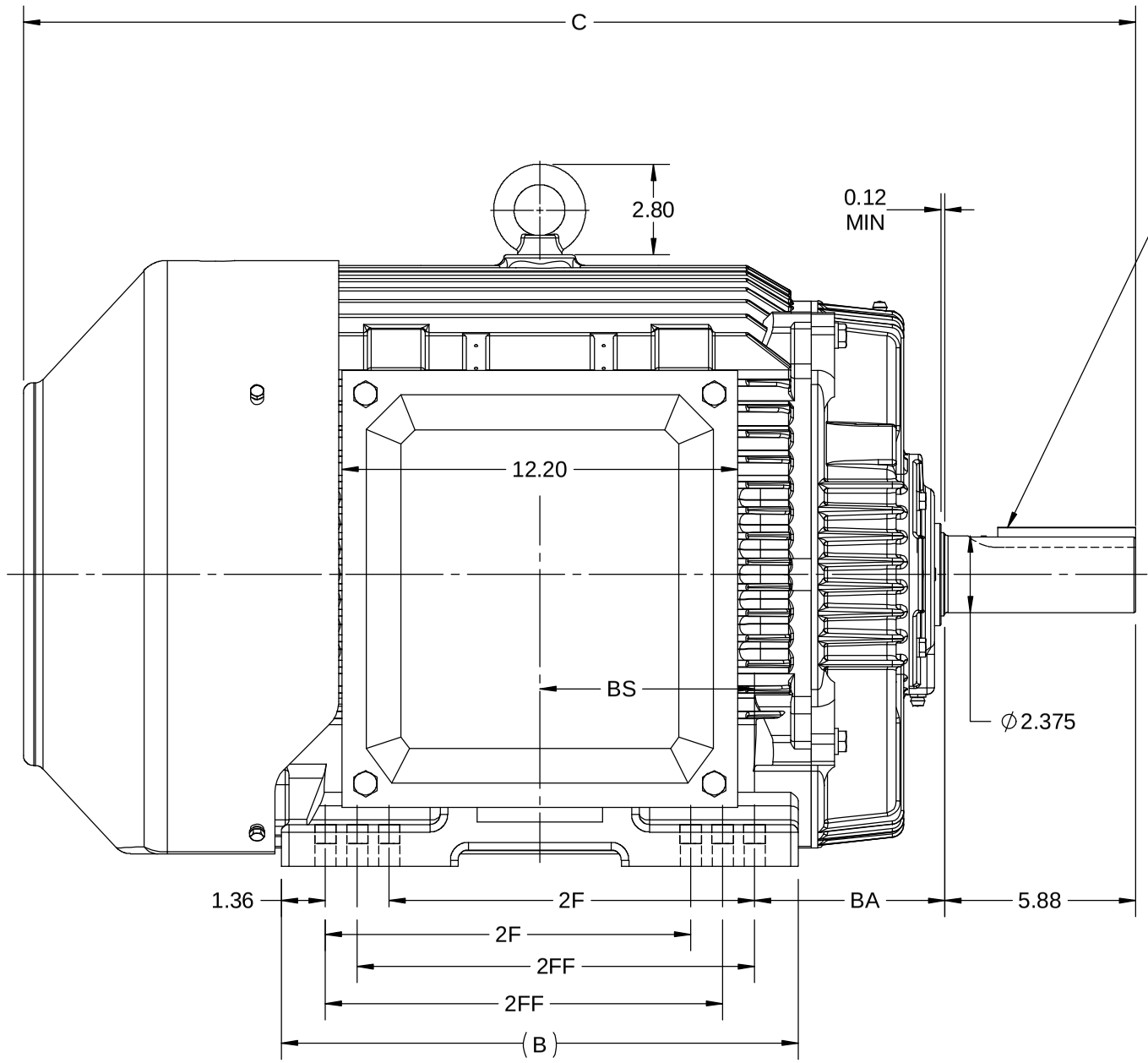
Nameplate Specifications

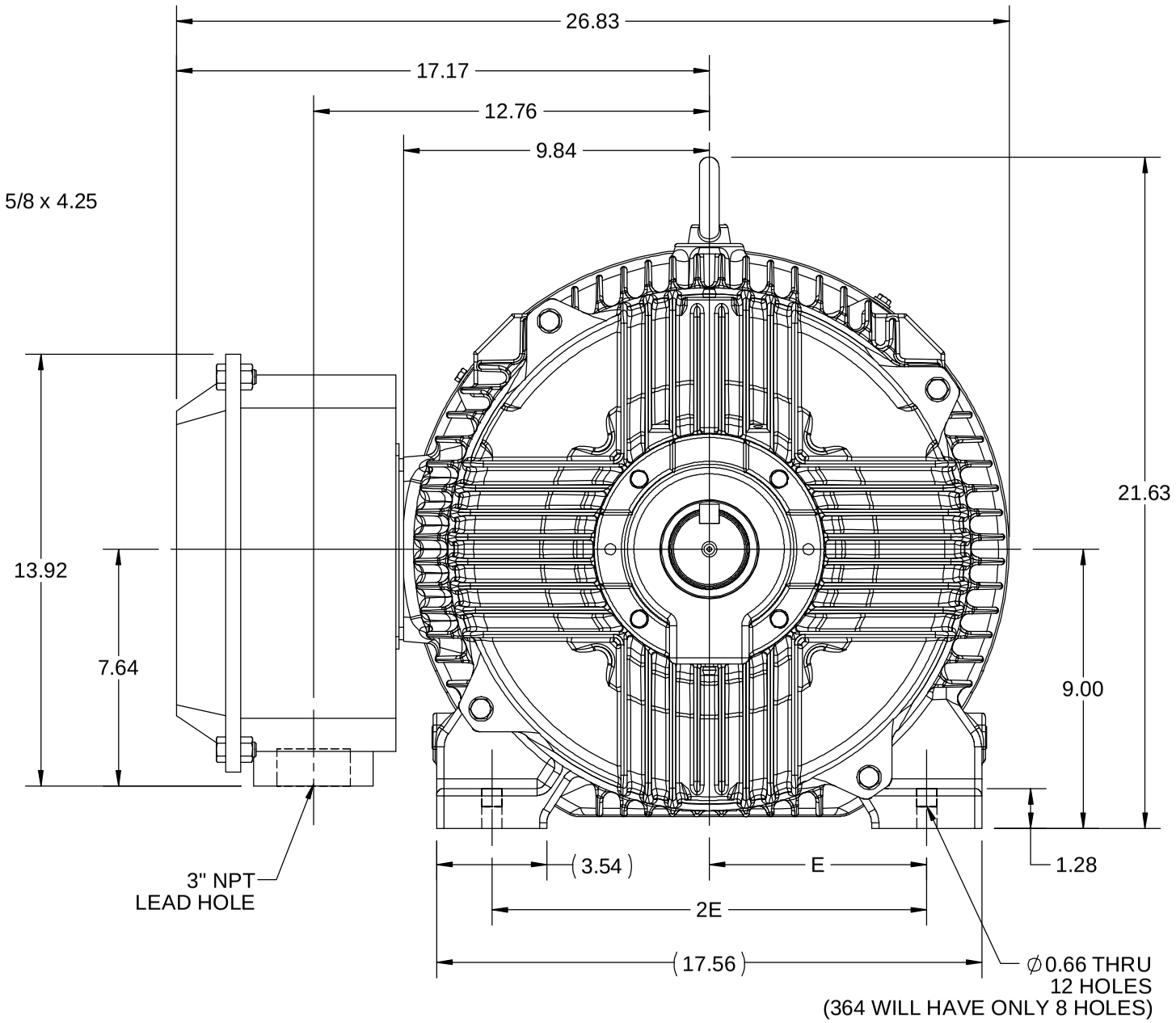
Output HP	60 Hp	Output KW	45.0 kW
Frequency	60 Hz	Voltage	230/460 V
Current	138.0/69.0 A	Speed	1782 rpm
Service Factor	1.15	Phase	3
Efficiency	95 %	Power Factor	85.5
Duty	Continuous	Insulation Class	F
Design Code	B	KVA Code	G
Frame	364T	Enclosure	Totally Enclosed Fan Cooled
Thermal Protection	No	Ambient Temperature	40 °C
Drive End Bearing Size	6313	Opp Drive End Bearing Size	6213
UL	Listed	CSA	Y
CE	Y	IP Code	55
Hazardous Location	DIVISION 2 T2B		

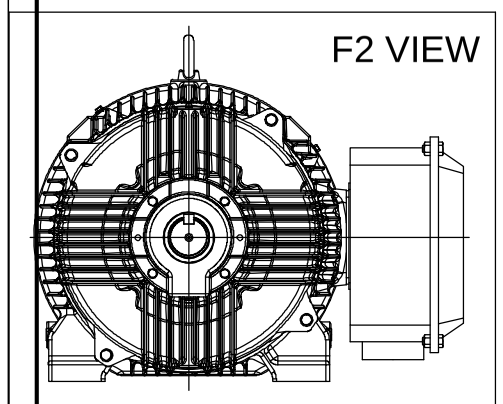
Technical Specifications

Electrical Type	Squirrel Cage Inverter Rated	Starting Method	Part Wdg Start Low Volt Only & Wye Start Delta Run Or Inverter
Poles	4	Rotation	Selective Clockwise
Resistance Main	.103 Ohms	Mounting	Rigid Base
Motor Orientation	Horizontal	Drive End Bearing	Ball
Opp Drive End Bearing	Ball	Frame Material	Cast Iron
Shaft Type	T	Overall Length	33.32 in
Shaft Diameter	2.375 in	Shaft Extension	5.88 in
Assembly/Box Mounting	F1/F2 CAPABLE		
Connection Drawing	EE7308AA	Outline Drawing	SS556999-100

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	14.96	33.30	7.00	14.00	-	11.25	5.88	6.12	F1 OR F2	364T
200	15.94	34.30			11.25	12.25		6.62		364/365T







DRAWING REVISION	REVISION BY	REV DATE/© DATE
C	S SAHOO	17/11/2020
ECO	APPROVED BY	DATE
ECO-0194715	GNK	17/11/2020

ECO DESCRIPTION: OUTLINE UPDATED

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

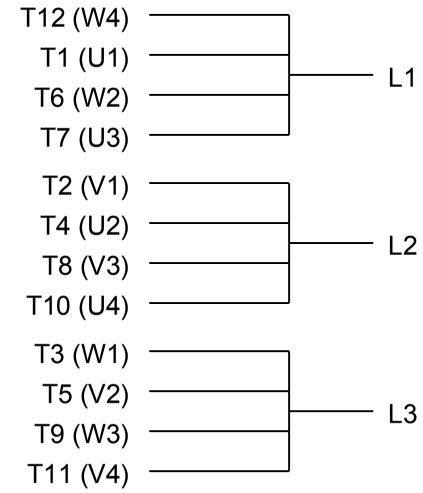
DRAWN BY	NIV
DATE	25/03/2016
APPROVED BY	SBD
DATE	25/03/2016
REFERENCE	
THIRD ANGLE PROJECTION	

REGAL® Regal Beloit America, Inc.

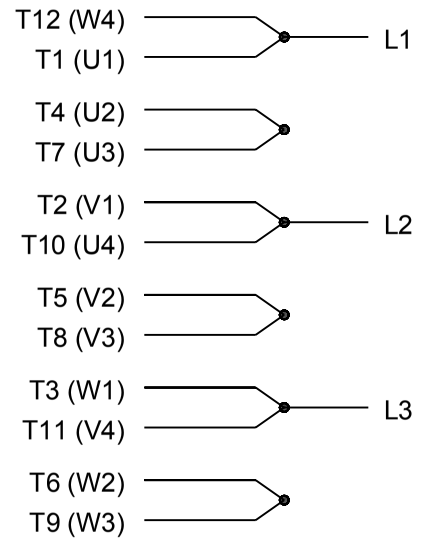
DESCRIPTION: OUTLINE
360T FR-TEFC

MATERIAL | PROCESS/FINISH

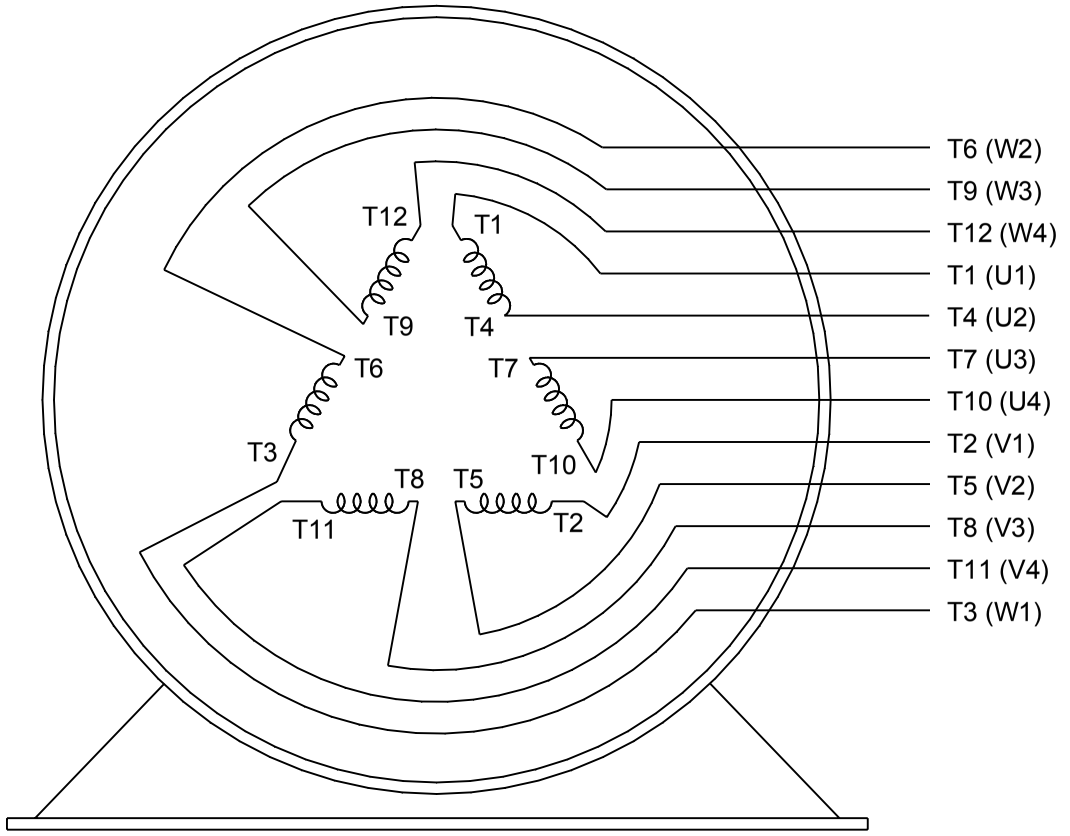
SIZE: B | DRAWING NUMBER: SS556999 | SHEET: 1 OF 1



LOW VOLTAGE



HIGH VOLTAGE



VIEW OF TERMINAL END

DRAWING REVISION: K	REVISION BY: AJW	DATE: 07-17-2015	DRAWN BY: LZ	Regal Beloit America, Inc.	
ECO: ECO-0081632	APPROVED BY: T. VUE	DATE: 07-17-2015	DATE: 01-12-1994		
ECO DESCRIPTION: REV'D IEC MARKINGS PER IEC 60034-8			APPROVED BY: GK	DESCRIPTION: CONN DIAGRAM-EXTERNAL	
			DATE: 01-14-1994	3Ø-2/1 DELTA-12 LEADS	
			REFERENCE	MATERIAL	PROCESS/FINISH
			THIRD ANGLE PROJECTION	SIZE: A	DRAWING NUMBER: EE7308AA
					SHEET: 1 OF 1

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 364TTFCD6036 BB

CONN. DIAGRAM: EE7308AA

CUSTOMER PART #:

OUTLINE: SS556999-364T

MOUNTING: F1/F2 CAPABLE

WINDING #: HE32254010 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
60&50	45.0&37.0	1800	1782&1480	364T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	138/69&140/70	Y START D RUN OR INV	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	95&94.5	3/4 LOAD EFF:	95.4	1/2 LOAD EFF:	95	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	85.5&85.5	3/4 LOAD PF:	83	1/2 LOAD PF:	75.5	94.5	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
177 LB-FT	870 / 435	354 LB-FT 200 %	451 LB-FT 255 %	55

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
70 dBA	80 dBA	17.2 LB-FT^2	- LB-FT^2	25 SEC.	2	805 LBS.

***** SUPPLEMENTAL INFORMATION *****

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6313	6213						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

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INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:42:15 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 12/13/2018
Customer:
Attention:
Submitted by: FAREEDA DUDEKULA

marathon® electric

364TTFCD6036

Submittal

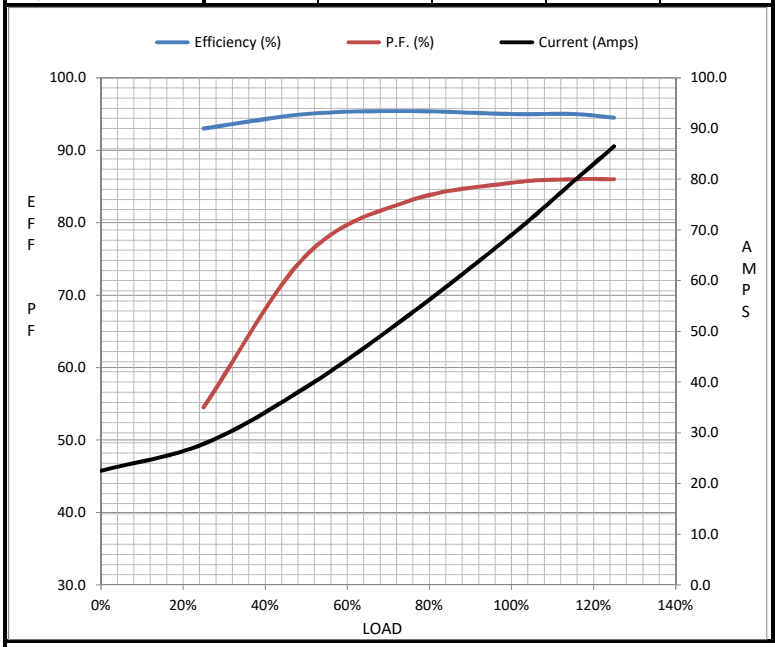
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	22.5	27.8	39.0	53.2	69.0	79.5	86.5	435	
Torque (ft-lb)	0.00	44.0	88.0	132	177	204	222	354	
RPM	1800	1795	1790	1785	1782	1,780	1775	0	
Efficiency (%)		93.0	95.0	95.4	95.0	95.0	94.5		
P.F. (%)	4.0	54.5	75.5	83.0	85.5	86.0	86.0	33.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1715	1782	1800
Current (Amps)	435	350	238	69.0	22.5
Torque (ft-lb)	354	297	451	177	0.00



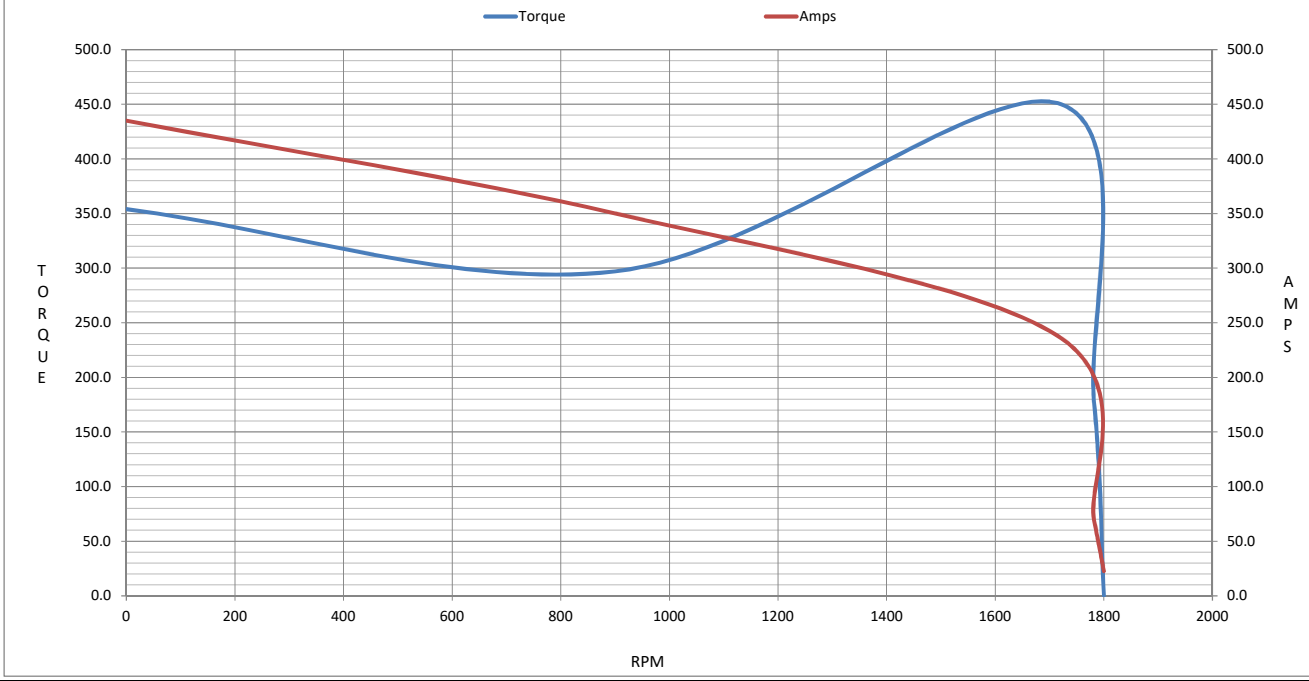
Information Block

HP	60.0	
Sync. RPM	1800	
Frame	364	
Enclosure	TEFC	
Construction	TFC	
Voltage	230/460#190/380	V
Frequency	60	Hz
Design	A	
LR Code letter	G	
Service Factor	1.15	
Temp Rise @ FL	55	° C
Duty	CONT	
Ambient	40	° C
Elevation	1,000	feet
Rotor/Shaft wk²	17.2	Lb-Ft²
Ref Wdg	HE32254010 NONE	
Sound Pressure @ 1M	70	dBA
VFD Rating	VARIABLE 10:1	
Outline Dwg	SS556999	
Conn. Diag	EE7308AA	
Additional Specifications:		
0		
0		

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0640	0.0400	0.3640	0.4870	11.7230

Speed -Torque Curve



PRODUCT INFORMATION PACKET

Model No: 365TTFCD6036
Catalog No: GT1043A
75 HP General Purpose Motor, 3 phase, 1800 RPM, 230/460 V, 365T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

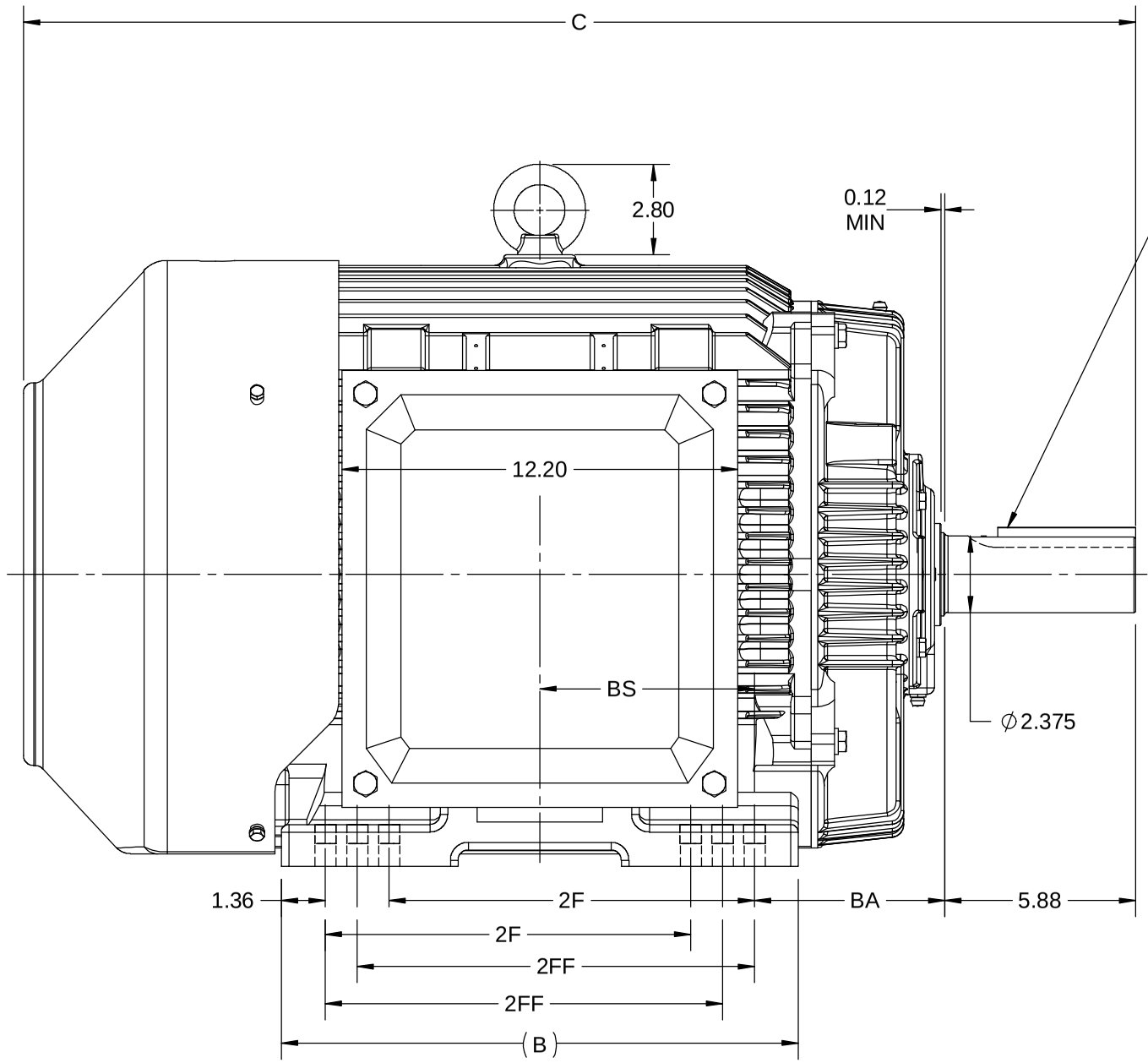
Nameplate Specifications

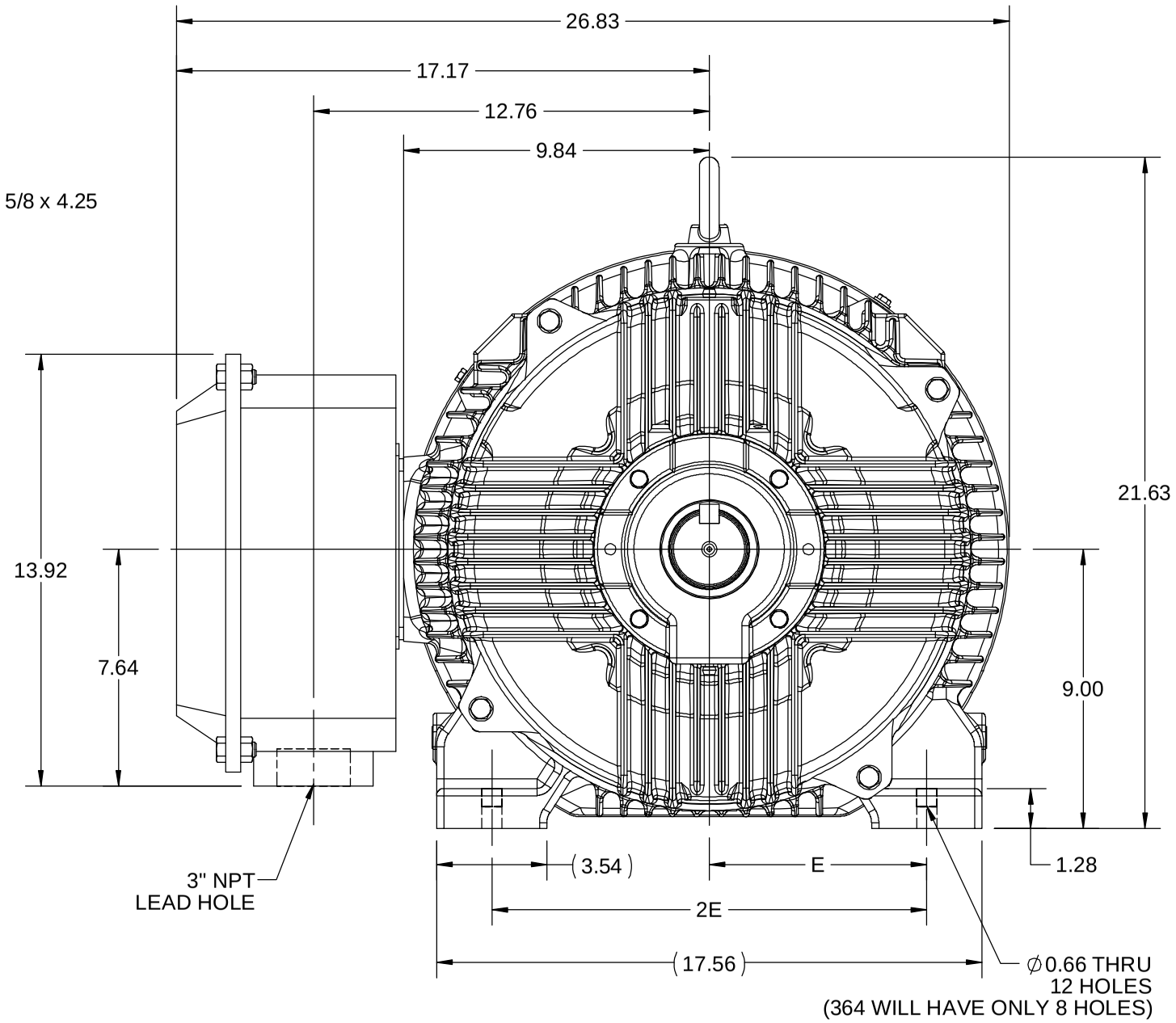
Output HP	75 Hp	Output KW	56.0 kW
Frequency	60 Hz	Voltage	230/460 V
Current	171.0/85.5 A	Speed	1782 rpm
Service Factor	1.15	Phase	3
Efficiency	95.4 %	Power Factor	86
Duty	Continuous	Insulation Class	F
Design Code	B	KVA Code	G
Frame	365T	Enclosure	Totally Enclosed Fan Cooled
Thermal Protection	No	Ambient Temperature	40 °C
Drive End Bearing Size	6313	Opp Drive End Bearing Size	6213
UL	Listed	CSA	Y
CE	Y	IP Code	55
Hazardous Location	DIVISION 2 T2B		

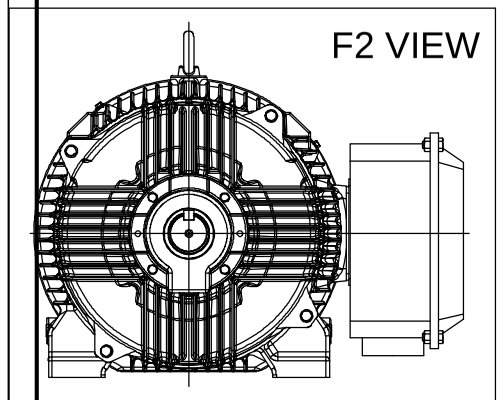
Technical Specifications

Electrical Type	Squirrel Cage Inverter Rated	Starting Method	Part Wdg Start Low Volt Only & Wye Start Delta Run Or Inverter
Poles	4	Rotation	Selective Clockwise
Resistance Main	.072 Ohms	Mounting	Rigid Base
Motor Orientation	Horizontal	Drive End Bearing	Ball
Opp Drive End Bearing	Ball	Frame Material	Cast Iron
Shaft Type	T	Overall Length	34.30 in
Shaft Diameter	2.375 in	Shaft Extension	5.88 in
Assembly/Box Mounting	F1/F2 CAPABLE		
Connection Drawing	EE7308AA	Outline Drawing	SS556999-200

DASH NO.	B	C	E	2E	2F	2FF	BA	BS	MOUNTING	FRAME
100	14.96	33.30	7.00	14.00	-	11.25	5.88	6.12	F1 OR F2	364T
200	15.94	34.30			11.25	12.25		6.62		364/365T







DRAWING REVISION	REVISION BY	REV DATE/© DATE
C	S SAHOO	17/11/2020
ECO	APPROVED BY	DATE
ECO-0194715	GNK	17/11/2020

ECO DESCRIPTION: OUTLINE UPDATED

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

DRAWN BY	NIV
DATE	25/03/2016
APPROVED BY	SBD
DATE	25/03/2016
REFERENCE	

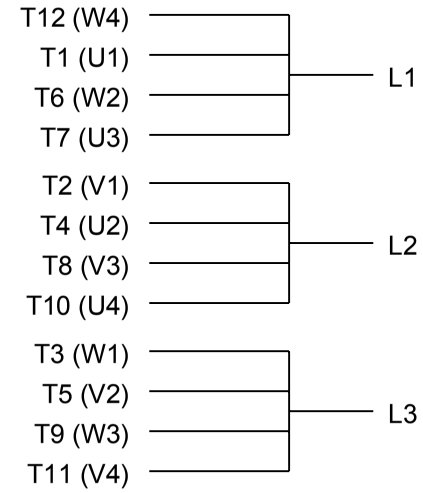
THIRD ANGLE PROJECTION

Regal Beloit America, Inc.

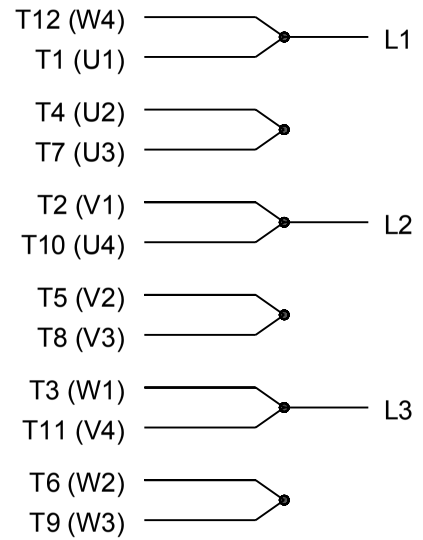
DESCRIPTION: OUTLINE
360T FR-TEFC

MATERIAL	PROCESS/FINISH

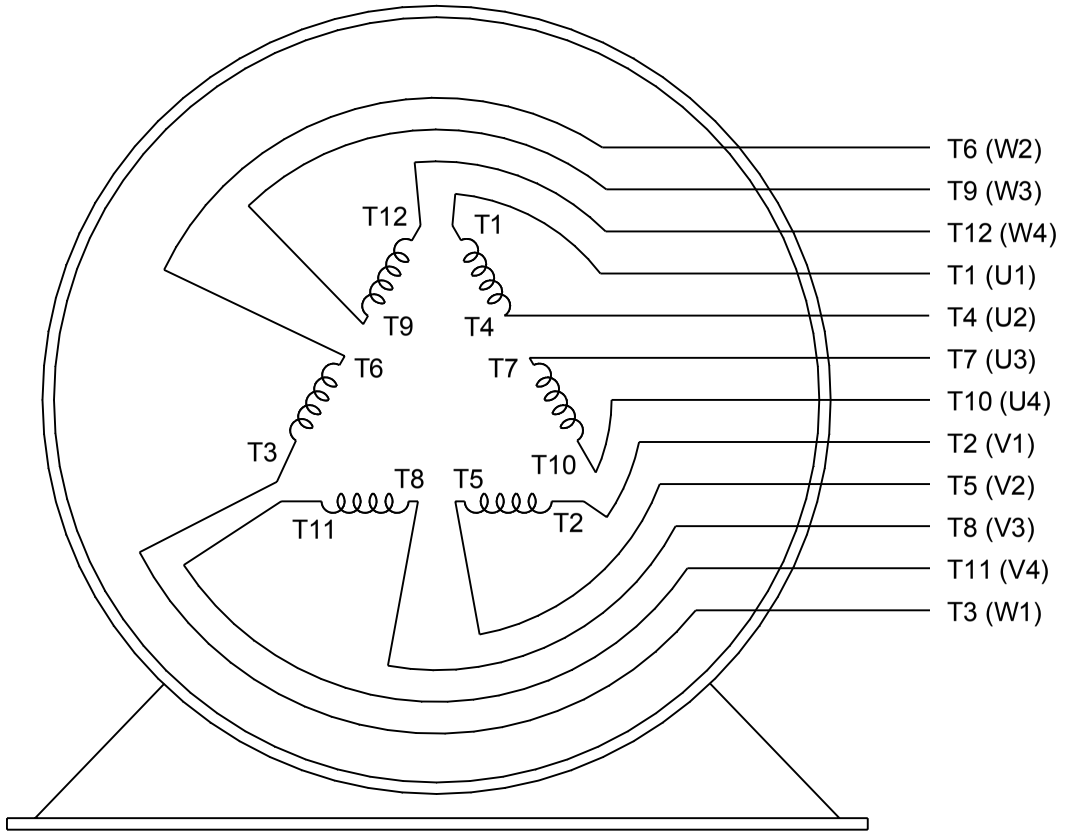
SIZE	DRAWING NUMBER	SHEET
B	SS556999	1 OF 1



LOW VOLTAGE



HIGH VOLTAGE



VIEW OF TERMINAL END

DRAWING REVISION: K	REVISION BY: AJW	DATE: 07-17-2015	DRAWN BY: LZ	Regal Beloit America, Inc.
ECO: ECO-0081632	APPROVED BY: T. VUE	DATE: 07-17-2015	DATE: 01-12-1994	
ECO DESCRIPTION: REV'D IEC MARKINGS PER IEC 60034-8			APPROVED BY: GK	DESCRIPTION: CONN DIAGRAM-EXTERNAL
			DATE: 01-14-1994	3Ø-2/1 DELTA-12 LEADS
			REFERENCE	MATERIAL / PROCESS/FINISH
			THIRD ANGLE PROJECTION	SIZE: A / DRAWING NUMBER: EE7308AA / SHEET: 1 OF 1

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 365TTFCD6036 BB

CONN. DIAGRAM: EE7308AA

CUSTOMER PART #:

OUTLINE: SS556999-365T

MOUNTING: F1/F2 CAPABLE

WINDING #: HE32254009 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
75&60	56.0&45.0	1800	1782&1482	365T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	171/85.5&166/83	Y START D RUN OR INV	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	95.4&95.2	3/4 LOAD EFF:	95.4	1/2 LOAD EFF:	95	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	86&86	3/4 LOAD PF:	83.5	1/2 LOAD PF:	76.2	95	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
221 LB-FT	1084 / 542	464 LB-FT 210 %	586 LB-FT 265 %	65

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
70 dBA	80 dBA	20.5 LB-FT^2	- LB-FT^2	20 SEC.	2	983 LBS.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6313	6213						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

*****

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INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:37:53 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 12/14/2018
Customer:
Attention:
Submitted by: FAREEDA DUDEKULA

365TTFCD6036

Submittal

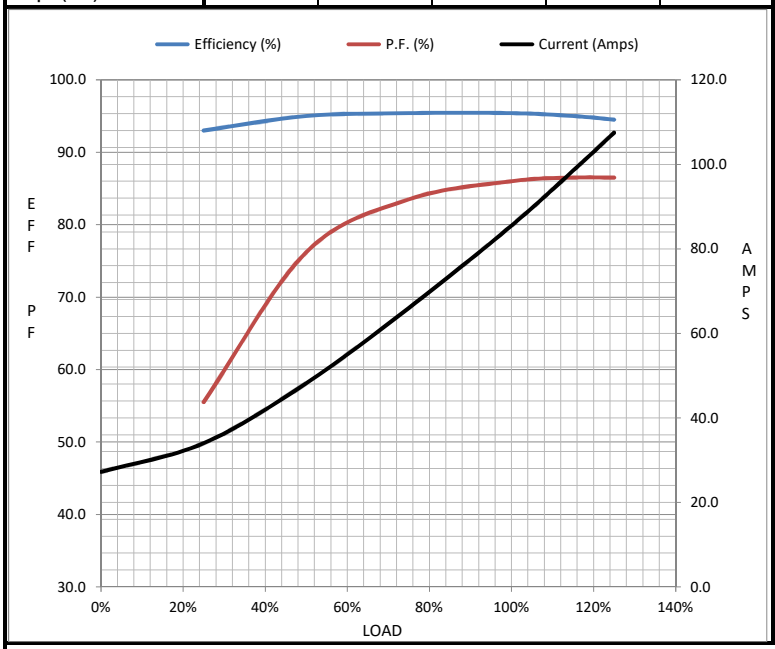
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	27.2	34.0	48.2	66.0	85.5	98.5	108	542	
Torque (ft-lb)	0.00	55.0	110	166	221	254	280	464	
RPM	1800	1795	1792	1788	1782	1,780	1775	0	
Efficiency (%)		93.0	95.0	95.4	95.4	95.0	94.5		
P.F. (%)	3.5	55.5	76.2	83.5	86.0	86.5	86.5	34.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1715	1782	1800
Current (Amps)	542	425	303	85.5	27.2
Torque (ft-lb)	464	395	586	221	0.00

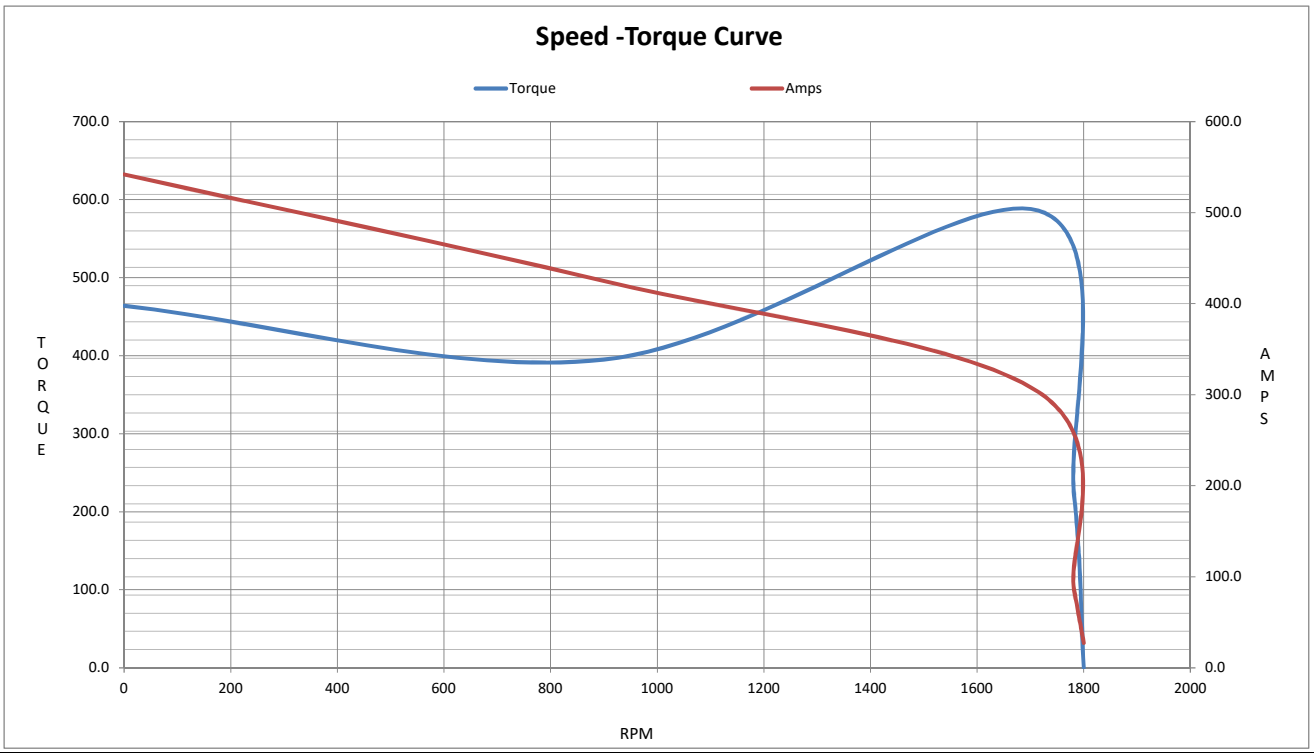


Information Block

HP	75.0
Sync. RPM	1800
Frame	365
Enclosure	TEFC
Construction	TFC
Voltage	230/460#190/380 V
Frequency	60 Hz
Design	A
LR Code letter	G
Service Factor	1.15
Temp Rise @ FL	65 ° C
Duty	CONT
Ambient	40 ° C
Elevation	1,000 feet
Rotor/Shaft wk²	20.5 Lb-Ft²
Ref Wdg	HE32254009 NONE
Sound Pressure @ 1M	70 dBA
VFD Rating	VARIABLE 10:1
Outline Dwg	SS556999
Conn. Diag	EE7308AA
Additional Specifications:	
0	
0	

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0450	0.0320	0.2720	0.4010	9.0720



PRODUCT INFORMATION PACKET

Model No: 405TTFCD6036
Catalog No: GT1046A
100 HP General Purpose Motor, 3 phase, 1800 RPM, 230/460 V, 405T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

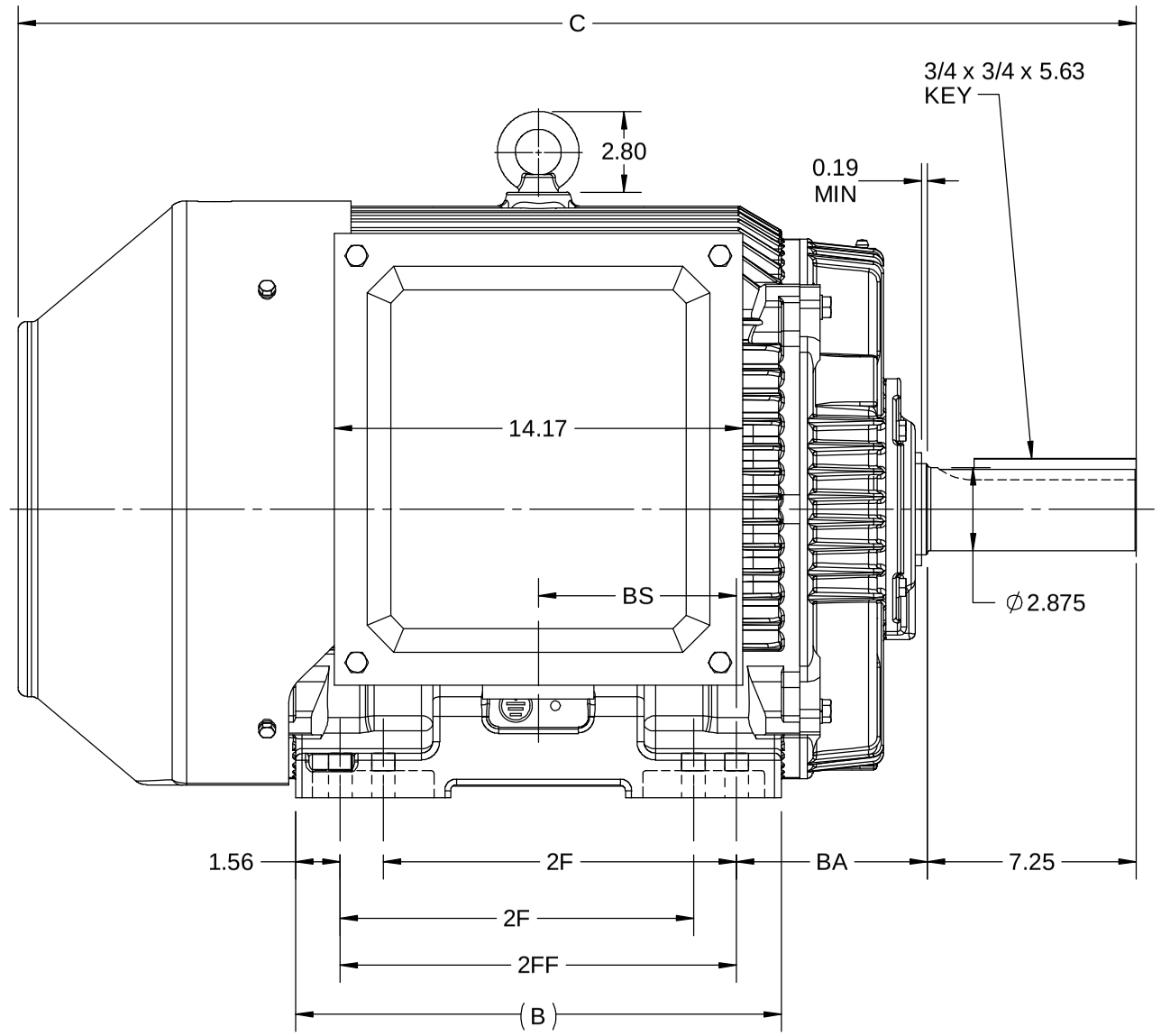
Nameplate Specifications

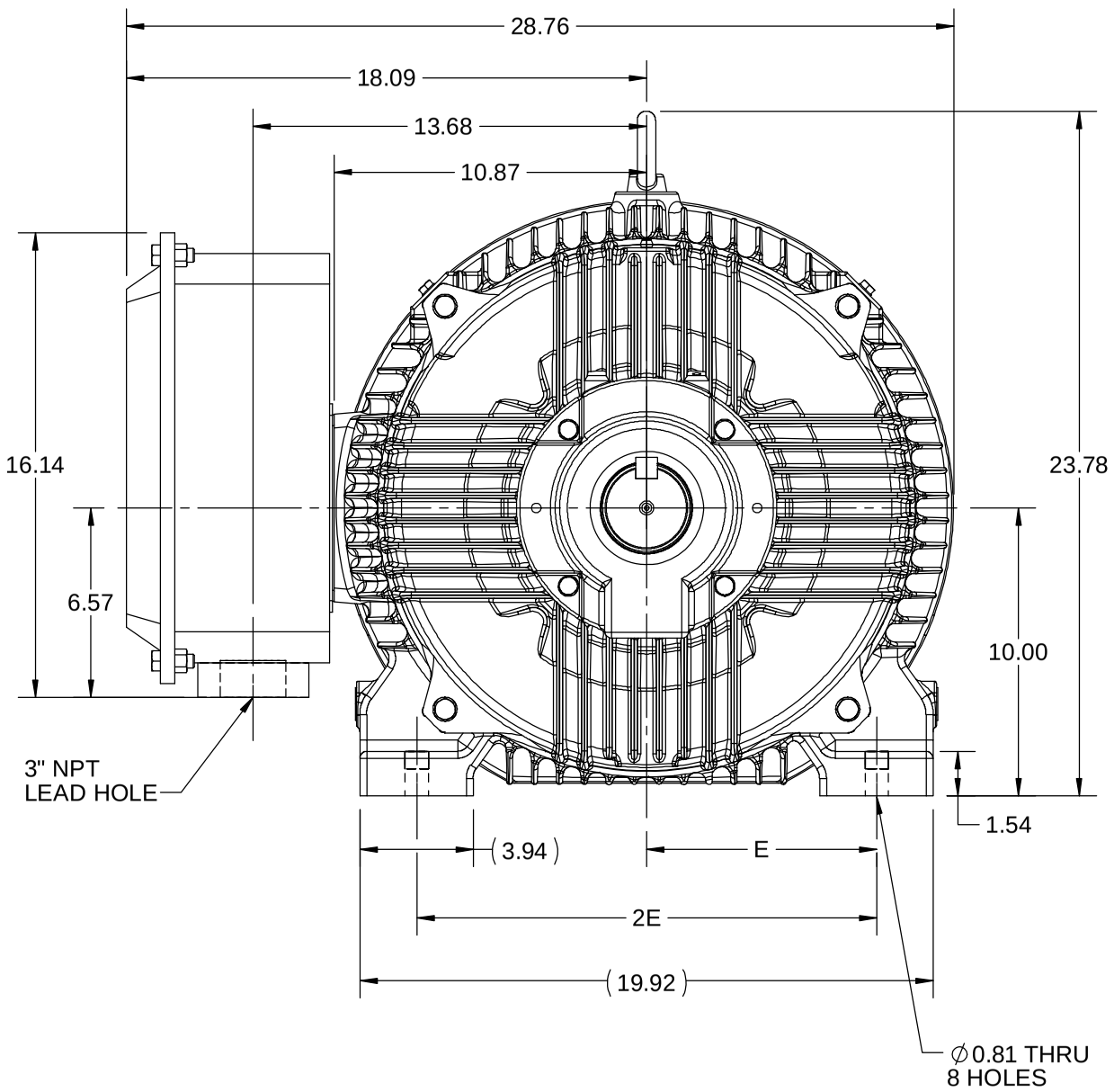
Output HP	100 Hp	Output KW	75.0 kW
Frequency	60 Hz	Voltage	230/460 V
Current	226.0/113.0 A	Speed	1785 rpm
Service Factor	1.15	Phase	3
Efficiency	95.4 %	Power Factor	87
Duty	Continuous	Insulation Class	F
Design Code	B	KVA Code	G
Frame	405T	Enclosure	Totally Enclosed Fan Cooled
Thermal Protection	No	Ambient Temperature	40 °C
Drive End Bearing Size	6316	Opp Drive End Bearing Size	6314
UL	Listed	CSA	Y
CE	Y	IP Code	55
Hazardous Location	DIVISION 2 T2B		

Technical Specifications

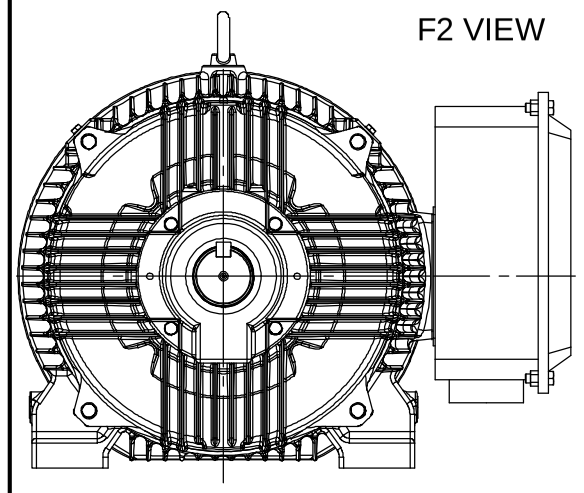
Electrical Type	Squirrel Cage Inverter Rated	Starting Method	Part Wdg Start Low Volt Only & Wye Start Delta Run Or Inverter
Poles	4	Rotation	Selective Clockwise
Resistance Main	.0555 Ohms	Mounting	Rigid Base
Motor Orientation	Horizontal	Drive End Bearing	Ball
Opp Drive End Bearing	Ball	Frame Material	Cast Iron
Shaft Type	T	Overall Length	38.77 in
Shaft Diameter	2.875 in	Shaft Extension	7.25 in
Assembly/Box Mounting	F1/F2 CAPABLE		
Outline Drawing	SS557005	Connection Drawing	EE7308AA

B	C	E	2E	2F	2FF	BA	BS	MOUNTING
16.85	38.77	8.00	16.00	12.25	13.75	6.62	6.87	F1 OR F2





F2 VIEW



DRAWING REVISION	REVISION BY	REV DATE/© DATE
C	VS	25-11-2020
ECO	APPROVED BY	DATE
ECO-0195088	GNK	25-11-2020

ECO DESCRIPTION
DRAWING UPDATED

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

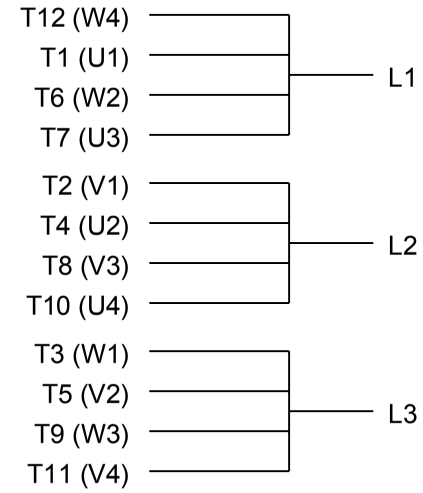
DRAWN BY	NIV
DATE	25/03/2016
APPROVED BY	SBD
DATE	25/03/2016
REFERENCE	
THIRD ANGLE PROJECTION	

REGAL® Regal Beloit America, Inc.

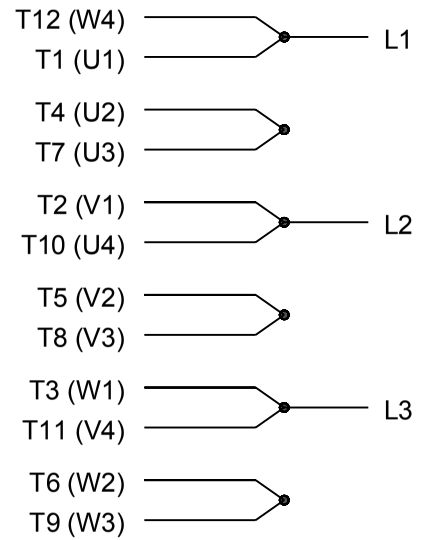
DESCRIPTION
OUTLINE
404/405T FR-NEMA-TEFC

MATERIAL	PROCESS/FINISH

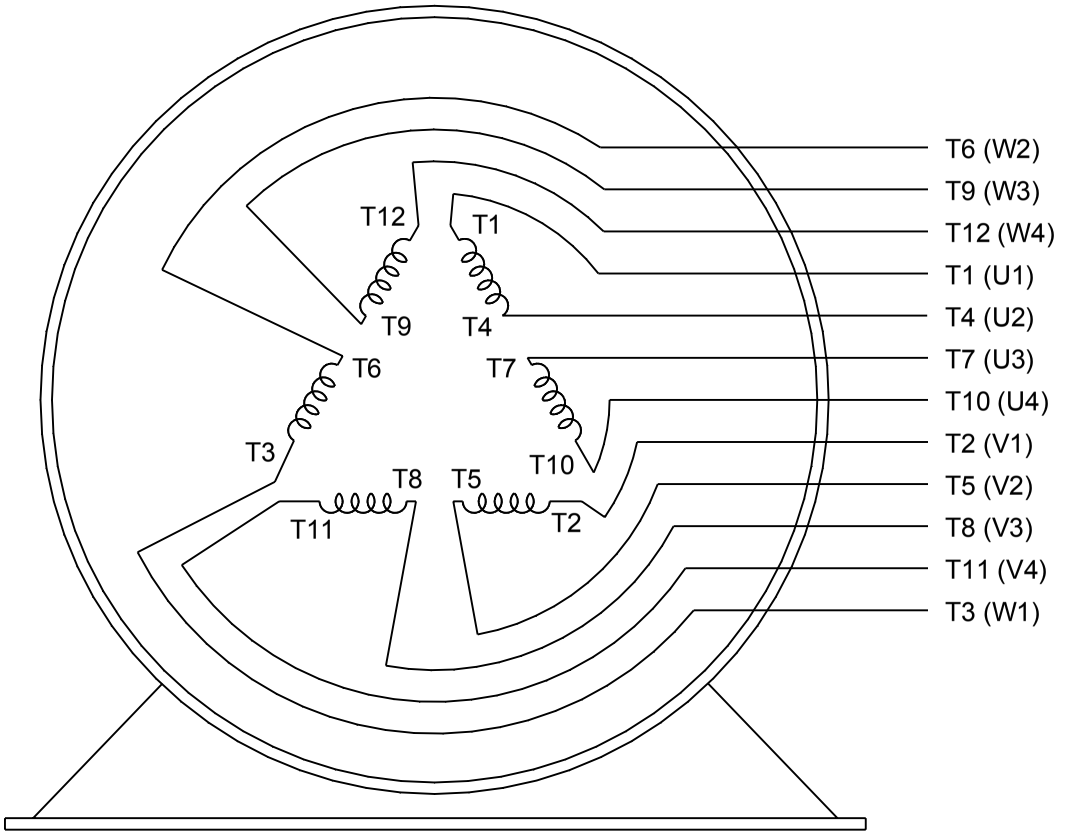
SIZE	DRAWING NUMBER	SHEET
B	SS557005	1 OF 1



LOW VOLTAGE



HIGH VOLTAGE



VIEW OF TERMINAL END

DRAWING REVISION: K	REVISION BY: AJW	DATE: 07-17-2015	DRAWN BY: LZ	Regal Beloit America, Inc.	
ECO: ECO-0081632	APPROVED BY: T. VUE	DATE: 07-17-2015	DATE: 01-12-1994		
ECO DESCRIPTION: REV'D IEC MARKINGS PER IEC 60034-8			APPROVED BY: GK	DESCRIPTION: CONN DIAGRAM-EXTERNAL	
			DATE: 01-14-1994	3Ø-2/1 DELTA-12 LEADS	
			REFERENCE	MATERIAL	PROCESS/FINISH
			THIRD ANGLE PROJECTION	SIZE: A	DRAWING NUMBER: EE7308AA
					SHEET: 1 OF 1

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 405TTFCD6036 BB

CONN. DIAGRAM: EE7308AA

CUSTOMER PART #:

OUTLINE: SS557005

MOUNTING: F1/F2 CAPABLE

WINDING #: HE32504006 2

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
100&75	75.0&56.0	1800	1785&1488	405T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	230/460&190/380	226/113&208/104	Y START D RUN OR INV	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	95.4&95	3/4 LOAD EFF:	95.4	1/2 LOAD EFF:	95	GTD. EFF	ELEC. TYPE
FULL LOAD PF:	87&86	3/4 LOAD PF:	83.5	1/2 LOAD PF:	74.5	95	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
294 LB-FT	1450 / 725	529 LB-FT 180 %	764 LB-FT 260 %	65

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
75 dBA	85 dBA	35 LB-FT^2	550 LB-FT^2	25 SEC.	2	1325 LBS.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6316	6314						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

NOTES

INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:45:13 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 12/13/2018
Customer:
Attention:
Submitted by: FAREEDA DUDEKULA

marathon® electric

405TTFCD6036

Submittal

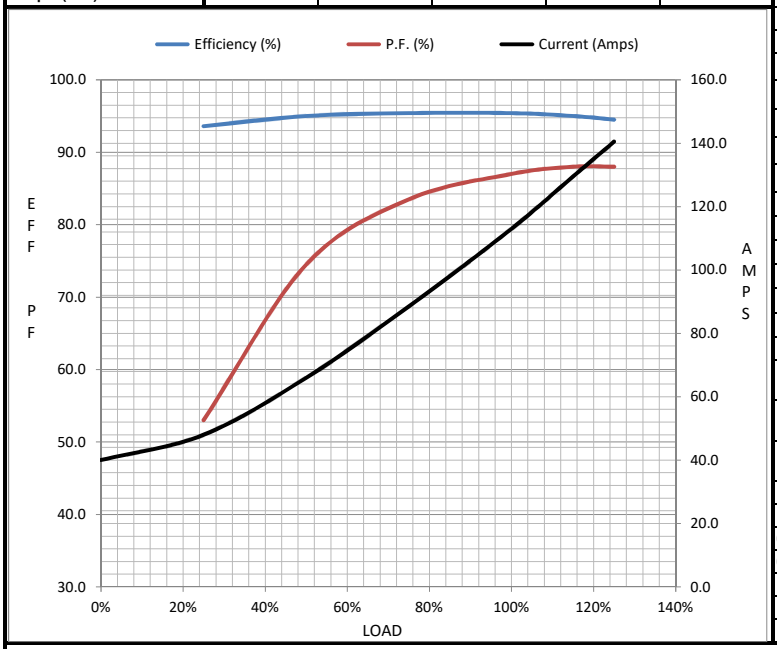
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	40.0	48.0	66.0	88.5	113	130	141	725	
Torque (ft-lb)	0.00	73.0	147	220	294	339	370	529	
RPM	1800	1796	1792	1790	1785	1,782	1780	0	
Efficiency (%)		93.6	95.0	95.4	95.4	95.0	94.5		
P.F. (%)	4.5	53.0	74.5	83.5	87.0	88.0	88.0	32.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1735	1785	1800
Current (Amps)	725	580	410	113	40.0
Torque (ft-lb)	529	445	764	294	0.00

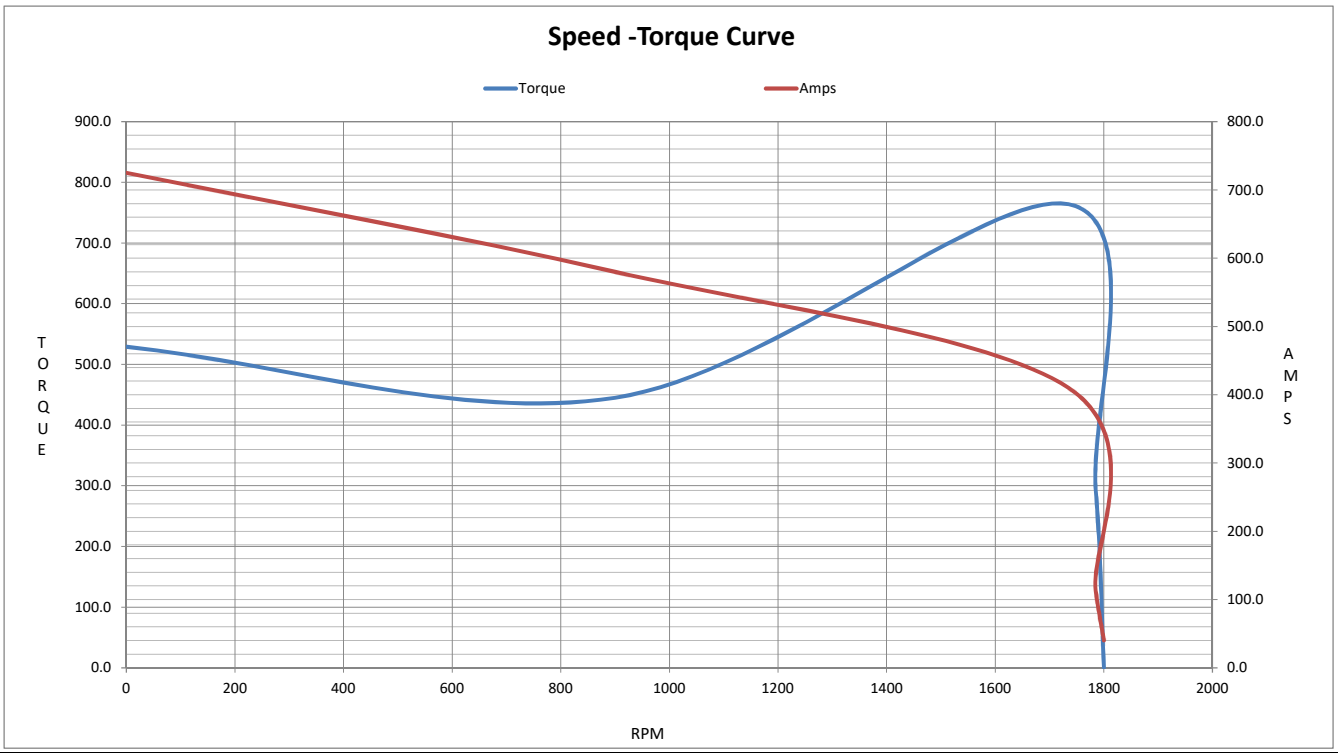


Information Block

HP	100.0	
Sync. RPM	1800	
Frame	405	
Enclosure	TEFC	
Construction	TFC	
Voltage	230/460#190/380	V
Frequency	60	Hz
Design	A	
LR Code letter	G	
Service Factor	1.15	
Temp Rise @ FL	65	° C
Duty	CONT	
Ambient	40	° C
Elevation	1,000	feet
Rotor/Shaft wk²	35.0	Lb-Ft²
Ref Wdg	HE32504006 NONE	
Sound Pressure @ 1M	75	dBA
VFD Rating	VARIABLE 10:1	
Outline Dwg	SS557005	
Conn. Diag	EE7308AA	
Additional Specifications:		
0		
0		

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0330	0.0200	0.1700	0.2840	6.5320



PRODUCT INFORMATION PACKET

Model No: 444TTFCD6036
Catalog No: GT1049A
125 HP General Purpose Motor, 3 phase, 1800 RPM, 460 V, 444T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

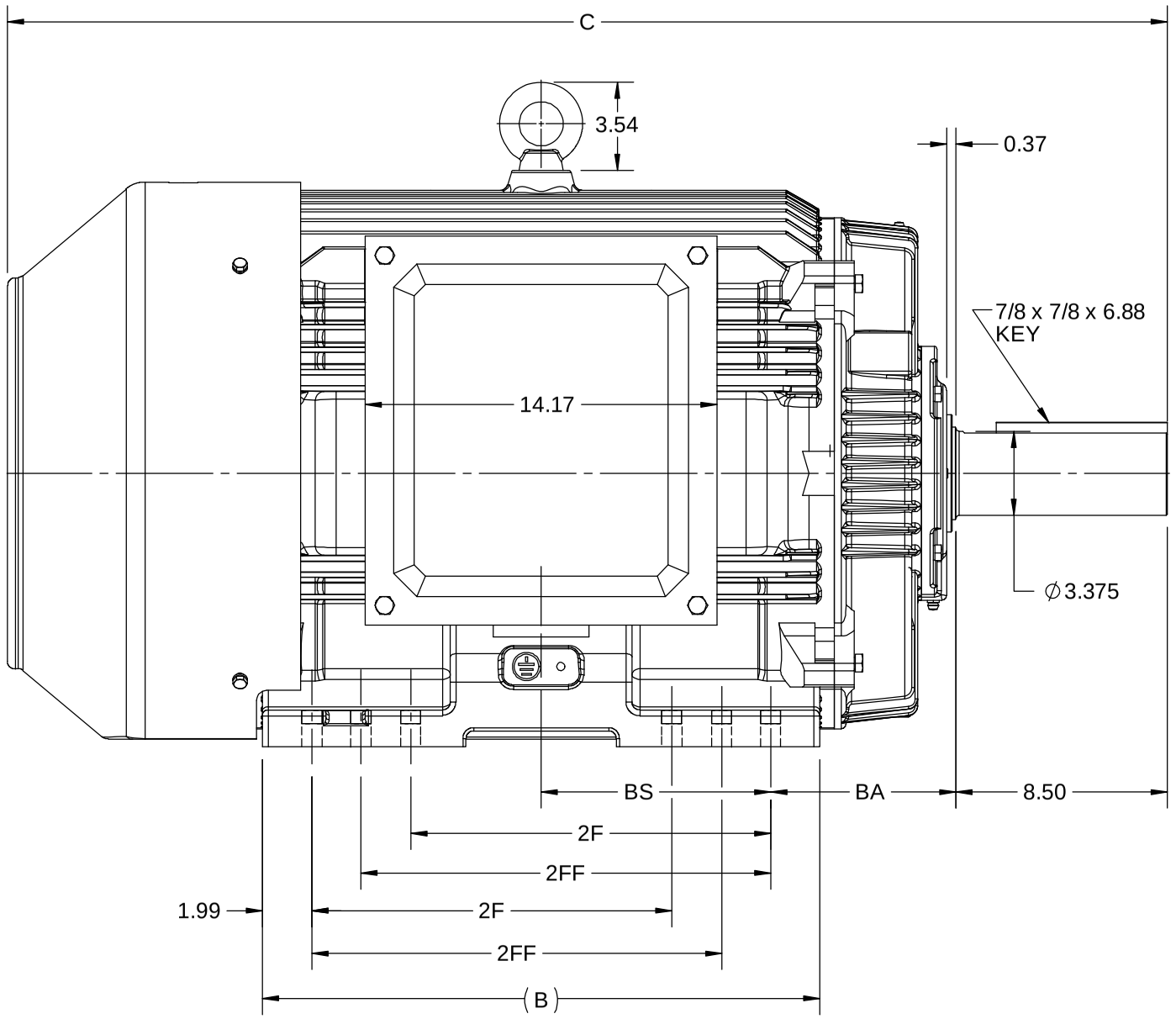
Nameplate Specifications

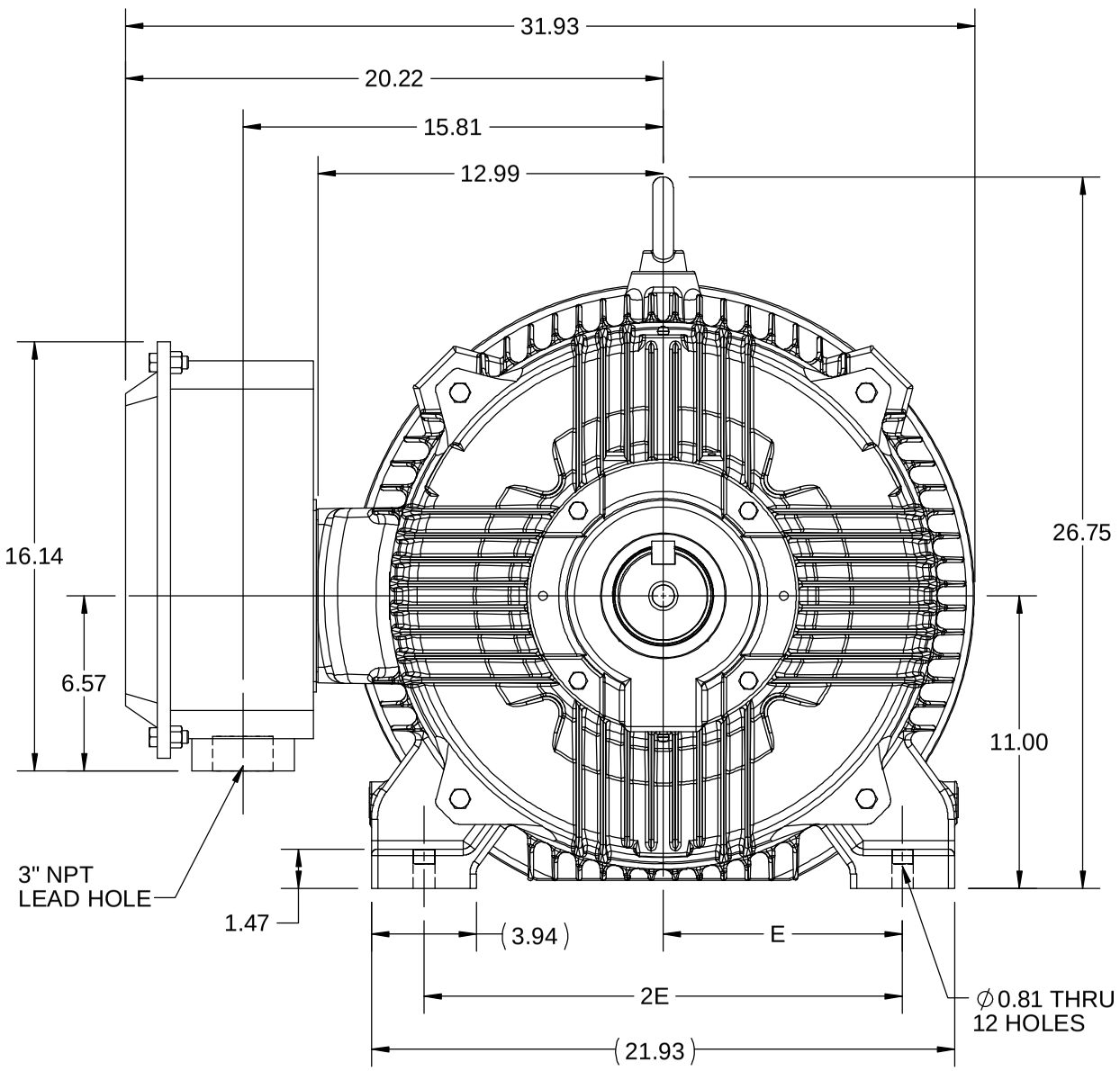
Output HP	**125 Hp**	Output KW	**93.0 kW**
Frequency	**60 Hz**	Voltage	**460 V**
Current	**140.0 A**	Speed	**1790 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**95.4 %**	Power Factor	**87**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**G**
Frame	**444T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6319**	Opp Drive End Bearing Size	**6317**
UL	**Listed**	CSA	**Y**
CE	**Y**	IP Code	**55**
Hazardous Location	**DIVISION 2 T2B**		

Technical Specifications

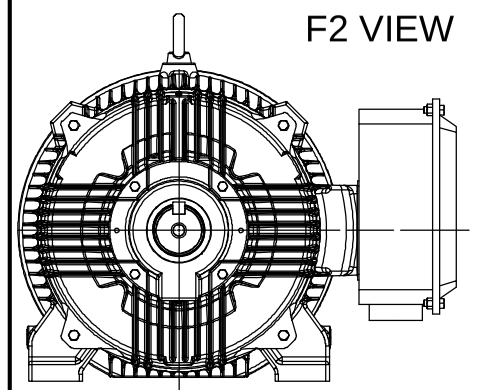
Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Part Wdg Start Or Inverter**
Poles	**4**	Rotation	**Selective Clockwise**
Resistance Main	**.0374 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Cast Iron**
Shaft Type	**T**	Overall Length	**46.71 in**
Shaft Diameter	**3.375 in**	Shaft Extension	**8.5 in**
Assembly/Box Mounting	**F1/F2 CAPABLE**		
Connection Drawing	**EE7341C**	Outline Drawing	**SS557009**

B	C	E	2E	2F	2FF	BA	BS	MOUNTING
22.44	46.71	9.00	18.00	14.50	16.50	7.50	9.24	F1 OR F2





F2 VIEW



DRAWING REVISION	REVISION BY	DATE
E	BISWA	12/10/2020
ECO	APPROVED BY	DATE
ECO-0195135	GNK	12/10/2020

ECO DESCRIPTION: DRAWING UPDATED

DRAWN BY	NIV
DATE	25/03/2016
APPROVED BY	SBD
DATE	25/03/2016
REFERENCE	
THIRD ANGLE PROJECTION	

REGAL™ Regal Beloit America, Inc.

DESCRIPTION: OUTLINE
444/445T FR-TEFC

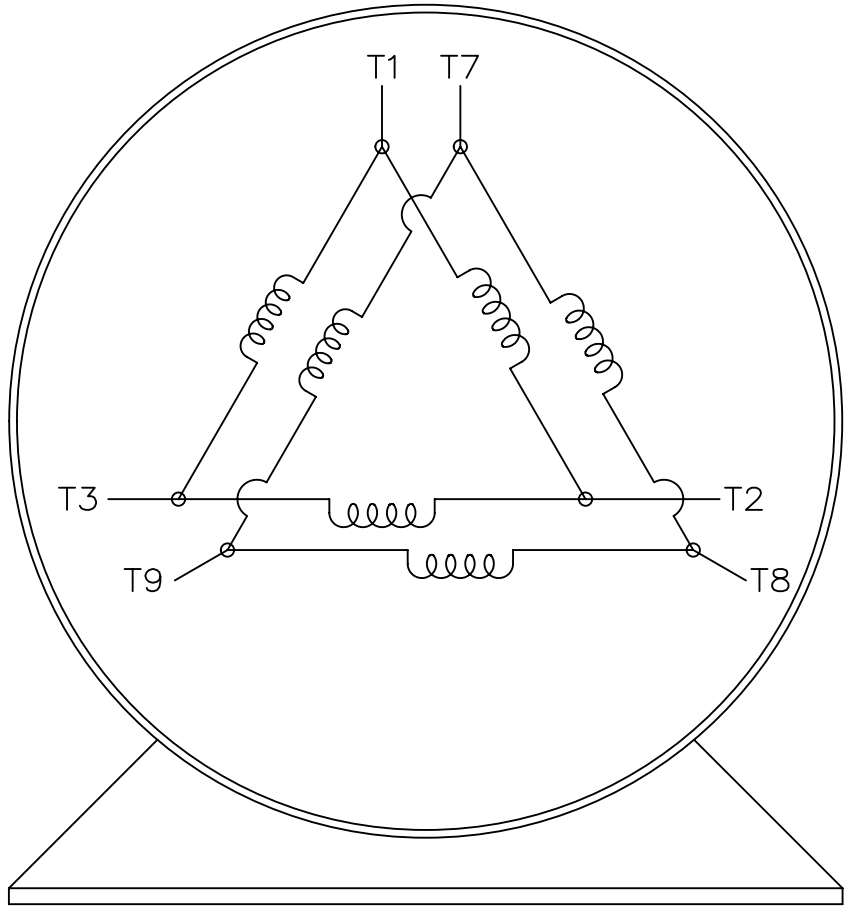
MATERIAL | PROCESS/FINISH

SIZE	DRAWING NUMBER	SHEET
B	SS557009	1 OF 1

THREE PHASE – PART WINDING START
DELTA – 6 LEADS

START
CONNECT T1 TO LINE 1
CONNECT T2 TO LINE 2
CONNECT T3 TO LINE 3
T7–T8–T9 OPEN

RUN
CONNECT T1&T7 TO LINE 1
CONNECT T2&T8 TO LINE 2
CONNECT T3&T9 TO LINE 3



VIEW OF TERMINAL END

IF MOTOR HAS 2 T'S

START
CONNECT T1,T1 TO LINE 1
CONNECT T2,T2 TO LINE 2
CONNECT T3,T3 TO LINE 3
T7,T7–T8,T8–T9,T9 OPEN

RUN
CONNECT T1,T1&T7,T7 TO LINE 1
CONNECT T2,T2&T8,T8 TO LINE 2
CONNECT T3,T3&T9,T9 TO LINE 3

NO.	REVISION	BY & DATE	CHK
E	NOTE ADDED FOR 2 T'S	NAR 17-12-2020	RC
D	RE–DRAWN WITH REGAL LOGO ECO–0110493	WGJ 09-30-2016	EMH

TOLERANCES UNLESS SPECIFIED

DEC.	INCHES
.X	± –
.XX	± –
.XXX	± –
.XXXX	± –
ANG	± –

REGAL REGAL-BELOIT CORPORATION

TITLE: CONNECTION DIAGRAM 3Ø – 6 LEADS

MAT'L.

FINISH

RFP

CAD FILE EE7341C

DIST

DRAWN BLR	03–09–1998
CHK ML	03–23–1998
APPD GK	03–23–1998
SCALE	1=1
REF	
FMF	
PREV	

SIZE A | DRAWING NO. EE7341C | PAGE OF | REV. E

P.O. BOX 8003
WAUSAU, WI 54401-8003
PH. 715-675-3311

CERTIFICATION DATA SHEET

CUSTOMER:

CUSTOMER PO#:

ORDER #:

MODEL #: 444TTFCD6036 BB

CONN. DIAGRAM: EE7341C

CUSTOMER PART #:

OUTLINE: SS557009

MOUNTING: F1/F2 CAPABLE

WINDING #: HE32804010 1

TYPICAL MOTOR PERFORMANCE DATA

HP	kW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
125&100	93.0&75.0	1800	1790&1490	444T	TEFC	G	B

PH	Hz	VOLTS	AMPS	START TYPE	DUTY	INSL	S.F.	AMB°C
3	60/50	460&380	140&136	PWS OR INVERTER	CONTINUOUS	F7	1.15/1.15	40

FULL LOAD EFF:	95.4&95.2	**3/4 LOAD EFF:**	95.4	**1/2 LOAD EFF:**	95	**GTD. EFF**	**ELEC. TYPE**
FULL LOAD PF:	87.5&87.5	**3/4 LOAD PF:**	84.2	**1/2 LOAD PF:**	77	95	SQ CAGE INV RATED

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
367 **LB-FT**	905	679 **LB-FT** 185 %	991 **LB-FT** 270 %	55

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS / HOUR	APPROX. MOTOR WGT
66 **dBA**	76 **dBA**	60 **LB-FT^2**	750 **LB-FT^2**	25 **SEC.**	2	1588 **LBS.**

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	ODE						
BALL	BALL	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON
6319	6317						

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE **VOLTS**

NOTES

INVERTER
TORQUE: CONSTANT 10:1/VARIABLE 10:1

INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

PREPARED BY: Anusha Muthyala
DATE: 09/24/2019 01:24:12 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 12/12/2018
Customer:
Attention:
Submitted by: FAREEDA DUDEKULA

marathon® electric

444TTFCD6036

Submittal

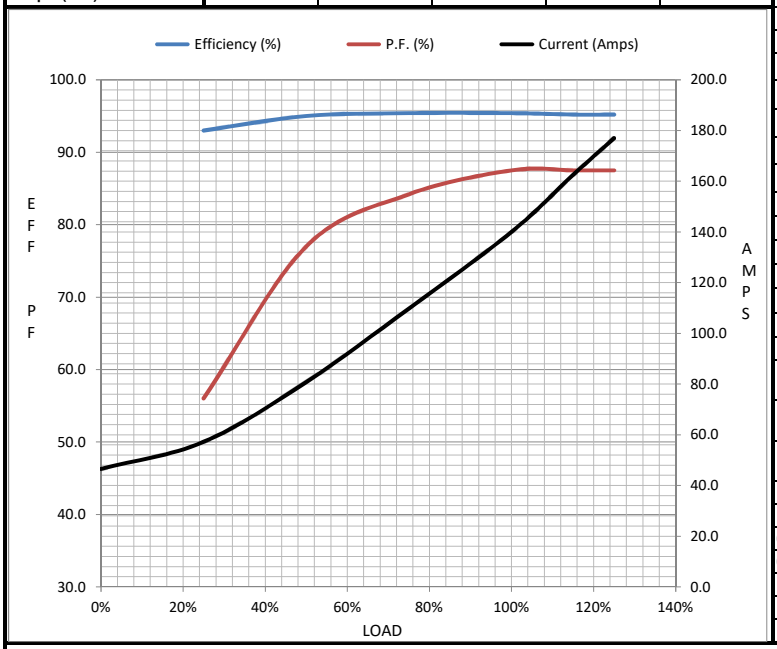
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	46.5	57.2	80.8	110	140	163	177	905	
Torque (ft-lb)	0.00	91.5	183	275	367	423	460	679	
RPM	1800	1796	1794	1792	1790	1,788	1786	0	
Efficiency (%)		93.0	95.0	95.4	95.4	95.2	95.2		
P.F. (%)	5.0	56.0	77.0	84.2	87.5	87.5	87.5	36.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1755	1790	1800
Current (Amps)	905	720	510	140	46.5
Torque (ft-lb)	679	570	991	367	0.00



Information Block

HP	125.0	
Sync. RPM	1800	
Frame	444	
Enclosure	TEFC	
Construction	TFC	
Voltage	460#380	V
Frequency	60	Hz
Design	A	
LR Code letter	G	
Service Factor	1.15	
Temp Rise @ FL	55	° C
Duty	CONT	
Ambient	40	° C
Elevation	1,000	feet
Rotor/Shaft wk²	60.0	Lb-Ft²
Ref Wdg	HE32804010 NONE	
Sound Pressure @ 1M	80	dBA
VFD Rating	VARIABLE 10:1	
Outline Dwg	SS557009	
Conn. Diag	EE7341C	

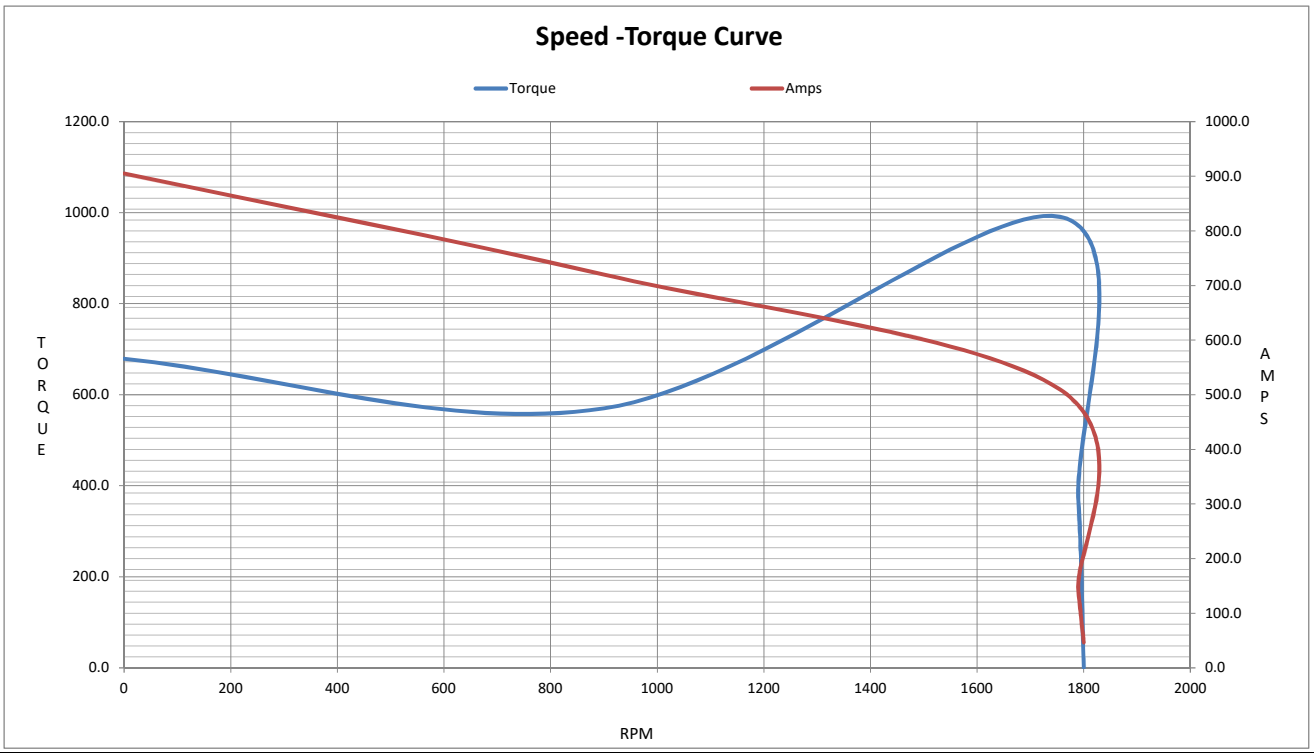
Additional Specifications:

0

0

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0230	0.0110	0.1520	0.2790	5.7890



PRODUCT INFORMATION PACKET

Model No: 445TTFCD6036
Catalog No: GT1052A
150 HP General Purpose Motor, 3 phase, 1800 RPM, 460 V, 445T Frame, TEFC
Three Phase TEFC Motors

marathon® Motors

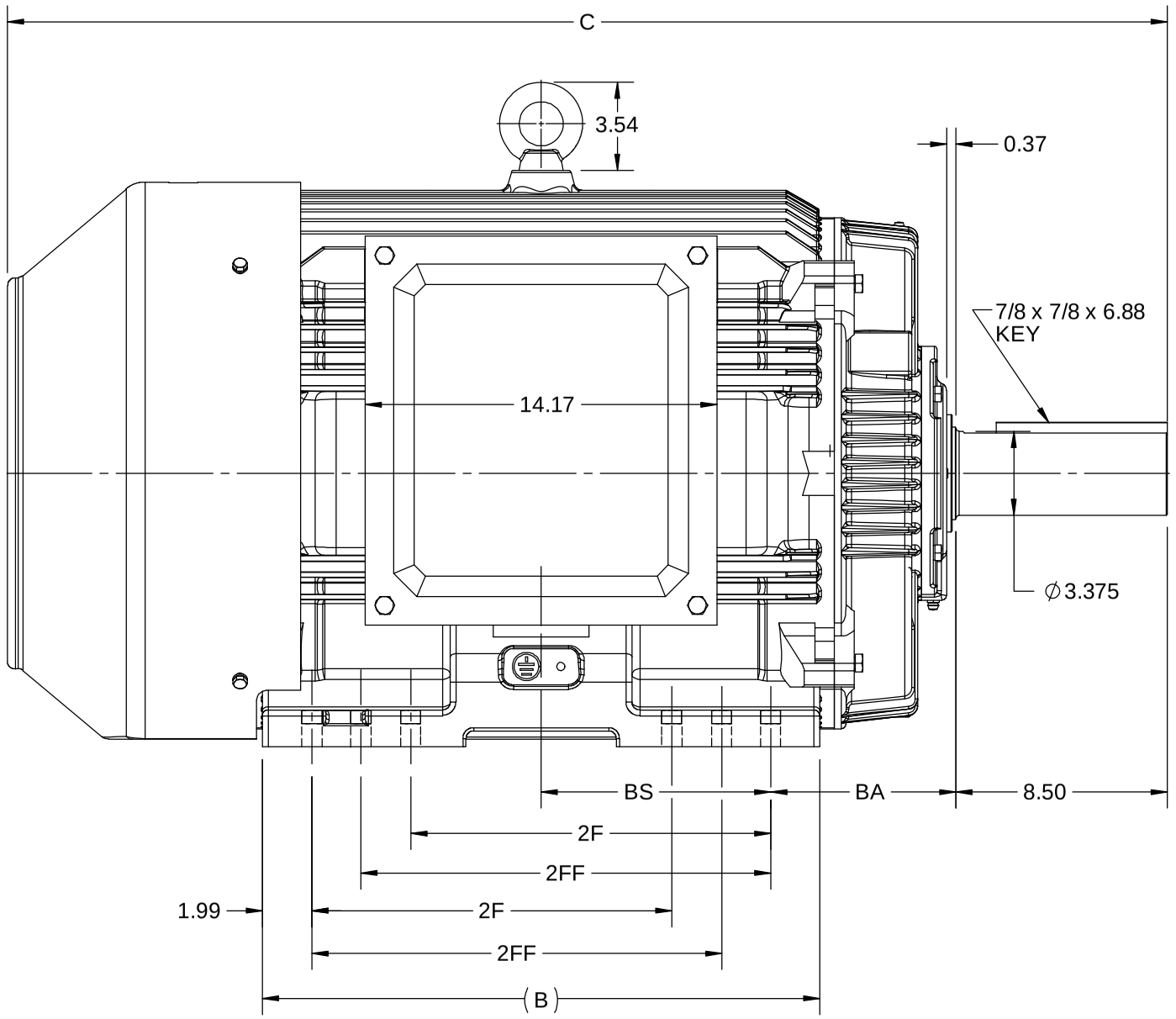
Nameplate Specifications

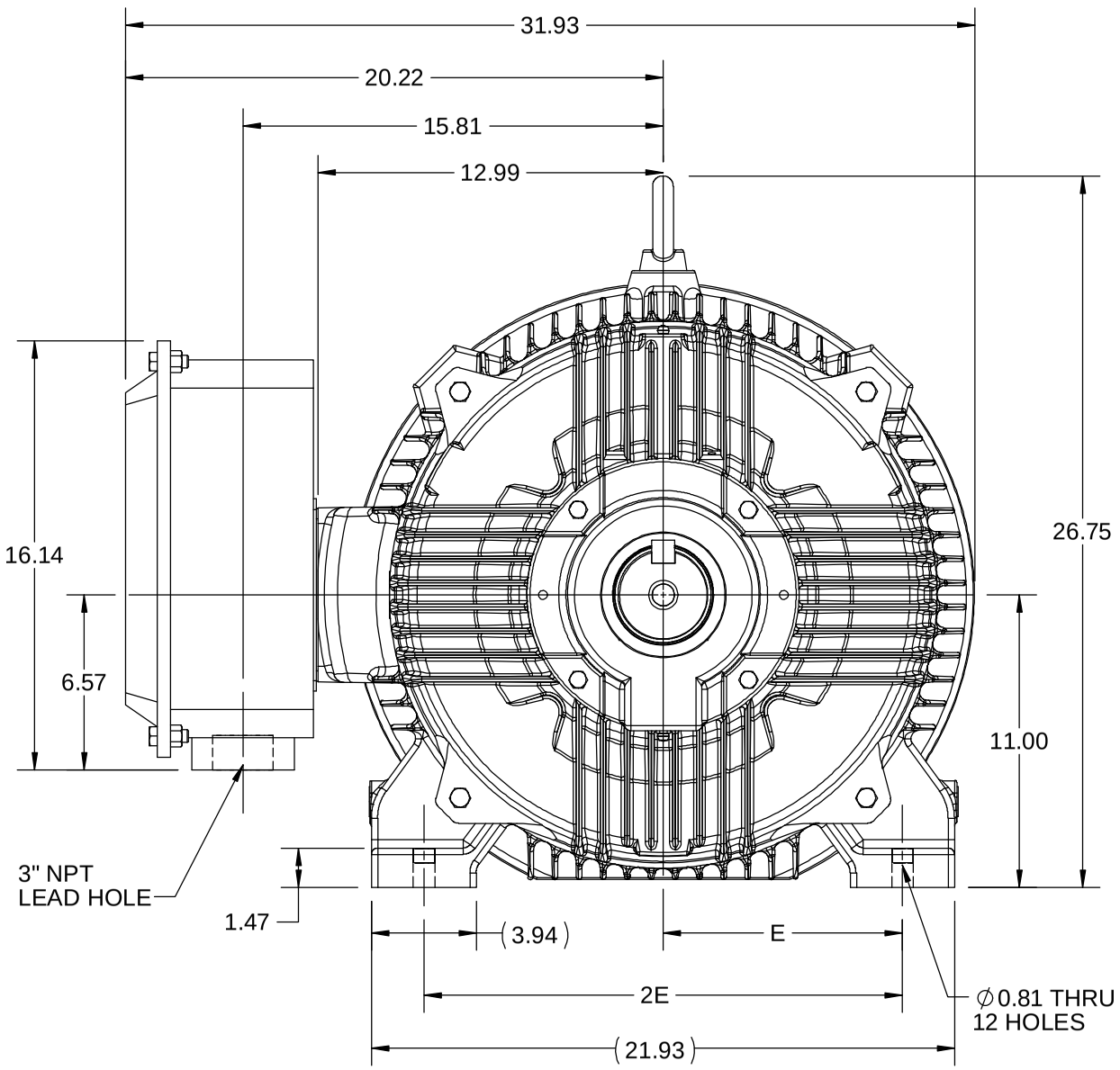
Output HP	**150 Hp**	Output KW	**112.0 kW**
Frequency	**60 Hz**	Voltage	**460 V**
Current	**169.0 A**	Speed	**1790 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**95.8 %**	Power Factor	**87**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**G**
Frame	**445T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6319**	Opp Drive End Bearing Size	**6317**
UL	**Listed**	CSA	**Y**
CE	**Y**	IP Code	**55**
Hazardous Location	**DIVISION 2 T2B**		

Technical Specifications

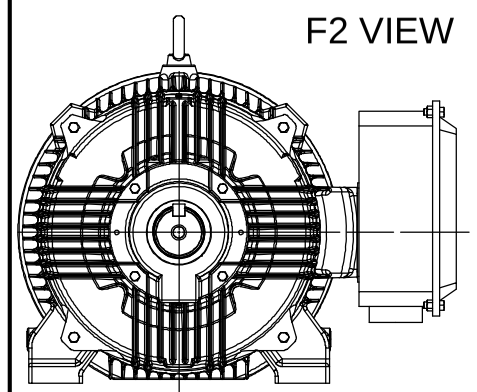
Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Part Wdg Start Or Inverter**
Poles	**4**	Rotation	**Selective Clockwise**
Resistance Main	**.0294 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Cast Iron**
Shaft Type	**T**	Overall Length	**46.71 in**
Shaft Diameter	**3.375 in**	Shaft Extension	**8.5 in**
Assembly/Box Mounting	**F1/F2 CAPABLE**		
Outline Drawing	**SS557009**	Connection Drawing	**EE7341C**

B	C	E	2E	2F	2FF	BA	BS	MOUNTING
22.44	46.71	9.00	18.00	14.50	16.50	7.50	9.24	F1 OR F2





F2 VIEW



DRAWING REVISION	REVISION BY	DATE
E	BISWA	12/10/2020
ECO	APPROVED BY	DATE
ECO-0195135	GNK	12/10/2020

ECO DESCRIPTION

DRAWING UPDATED

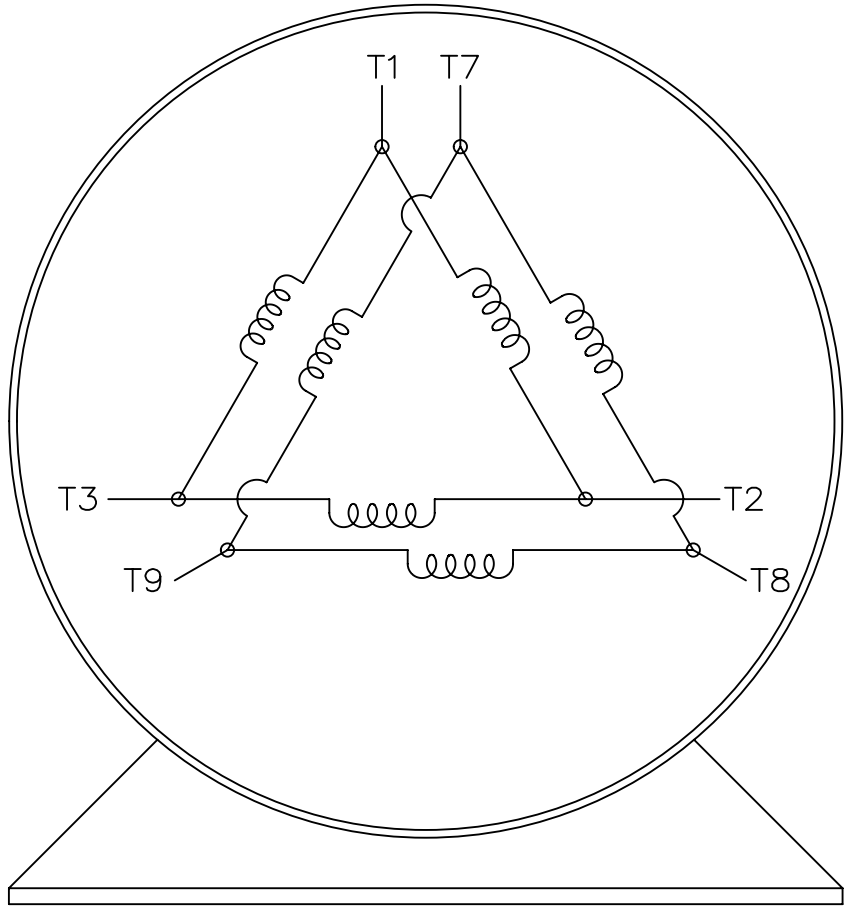
DRAWN BY	Regal Beloit America, Inc.	
NIV		
DATE	DESCRIPTION	
25/03/2016	OUTLINE 444/445T FR-TEFC	
APPROVED BY		
SBD		
DATE		
25/03/2016		
REFERENCE	MATERIAL	PROCESS/FINISH
THIRD ANGLE PROJECTION	SIZE: B — DRAWING NUMBER: SS557009	SHEET: 1 OF 1

EE7341C

THREE PHASE – PART WINDING START
DELTA – 6 LEADS

START
CONNECT T1 TO LINE 1
CONNECT T2 TO LINE 2
CONNECT T3 TO LINE 3
T7–T8–T9 OPEN

RUN
CONNECT T1&T7 TO LINE 1
CONNECT T2&T8 TO LINE 2
CONNECT T3&T9 TO LINE 3



VIEW OF TERMINAL END

IF MOTOR HAS 2 T'S

START
CONNECT T1,T1 TO LINE 1
CONNECT T2,T2 TO LINE 2
CONNECT T3,T3 TO LINE 3
T7,T7–T8,T8–T9,T9 OPEN

RUN
CONNECT T1,T1&T7,T7 TO LINE 1
CONNECT T2,T2&T8,T8 TO LINE 2
CONNECT T3,T3&T9,T9 TO LINE 3

NO.	REVISION	BY & DATE	CHK
E	NOTE ADDED FOR 2 T'S	NAR 17-12-2020	RC
D	RE–DRAWN WITH REGAL LOGO ECO–0110493	WGJ 09-30-2016	EMH

TOLERANCES UNLESS SPECIFIED

DEC.	INCHES
.X	± –
.XX	± –
.XXX	± –
.XXXX	± –
ANG	± –

REGAL REGAL-BELOIT CORPORATION

TITLE: CONNECTION DIAGRAM 3Ø – 6 LEADS

MAT'L.

FINISH

CAD FILE EE7341C

RFP

DIST

DRAWN BLR	03–09–1998
CHK ML	03–23–1998
APPD GK	03–23–1998
SCALE	1=1
REF	
FMF	
PREV	

SIZE A | DRAWING NO. EE7341C | PAGE OF | REV. E

CERTIFICATION DATA SHEET

Model#:	445TTFCD6036 AA	**WINDING#:**	HE32804011 NONE 1
CONN. DIAGRAM:	EE7341C	**ASSEMBLY:**	F1/F2 CAPABLE
OUTLINE:	SS557009		

TYPICAL MOTOR PERFORMANCE DATA

HP	KW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
150&125	112&93	1800	1790&1490	445T	TEFC	G	B

PH	Hz	VOLTS	FL AMPS	START TYPE	DUTY	INSL	S.F	AMB°C	ELEVATION
3	60/50	460#380	169&169	PWS OR INVERTER	CONTINUOUS	F7	1.15/1.15	40	3300

FULL LOAD EFF: 95.8&95.8	3/4 LOAD EFF: 95.8	1/2 LOAD EFF: 95.4	GTD. EFF	ELEC. TYPE	NO LOAD AMPS
FULL LOAD PF: 87&87.5	3/4 LOAD PF: 84.5	1/2 LOAD PF: 77	95.4	SQ CAGE INV RATED	54

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
440 LB-FT	1085	926 LB-FT 210	1232 LB-FT 280	55

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS /HOUR	APPROX. MOTOR WGT
80 dBA	90 dBA	80 LB-FT^2	1000 LB-FT^2	25 SEC.	2	3025 LBS.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	OPE						
BALL 6319	BALL 6317	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE /n HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

If Inverter equals NONE, contact factory for further information

INVERTER TORQUE: VARIABLE 10:1
INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

* NOTES *

DATE: 07/03/2017 02:10:43 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 1/28/2019
Customer:
Attention:
Submitted by: FAREEDA DUDEKULA

445TTFCD6036

Submittal

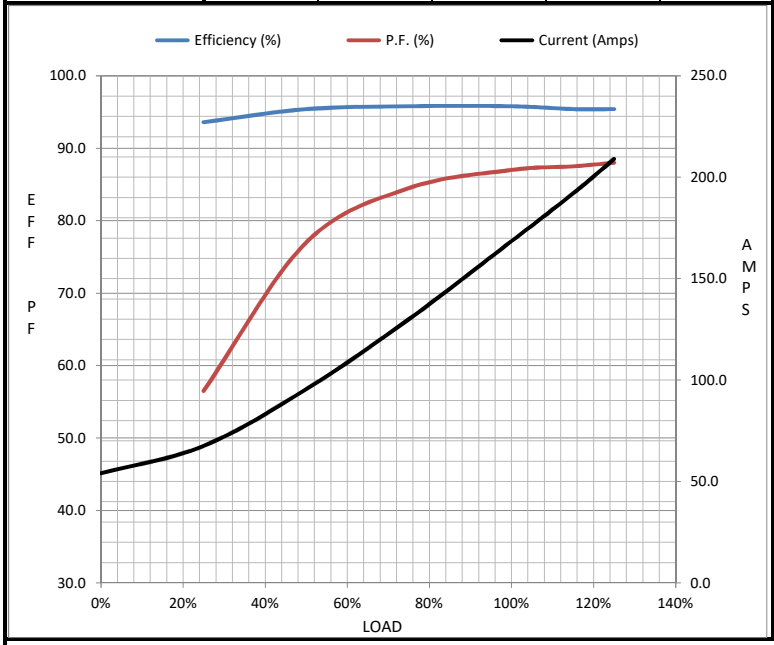
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	54.0	67.5	95.5	130	169	192	209	1,085	
Torque (ft-lb)	0.00	110	220	330	440	508	553	926	
RPM	1800	1798	1795	1792	1790	1,790	1788	0	
Efficiency (%)		93.6	95.4	95.8	95.8	95.4	95.4		
P.F. (%)	5.0	56.5	77.0	84.5	87.0	87.5	88.0	37.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1745	1790	1800
Current (Amps)	1,085	870	647	169	54.0
Torque (ft-lb)	926	780	1,232	440	0.00



Information Block

HP	150.0	
Sync. RPM	1800	
Frame	445	
Enclosure	TEFC	
Construction	TFC	
Voltage	460#380	V
Frequency	60	Hz
Design	B	
LR Code letter	G	
Service Factor	1.15	
Temp Rise @ FL	55	° C
Duty	CONT	
Ambient	40	° C
Elevation	3,300	feet
Rotor/Shaft wk²	80.0	Lb-Ft²
Ref Wdg	HE32804011 NONE	
Sound Pressure @ 1M	80	dBA
VFD Rating	CONSTANT 10:1/VARIABLE 10:1	
Outline Dwg	SS557009	
Conn. Diag	EE7341C	

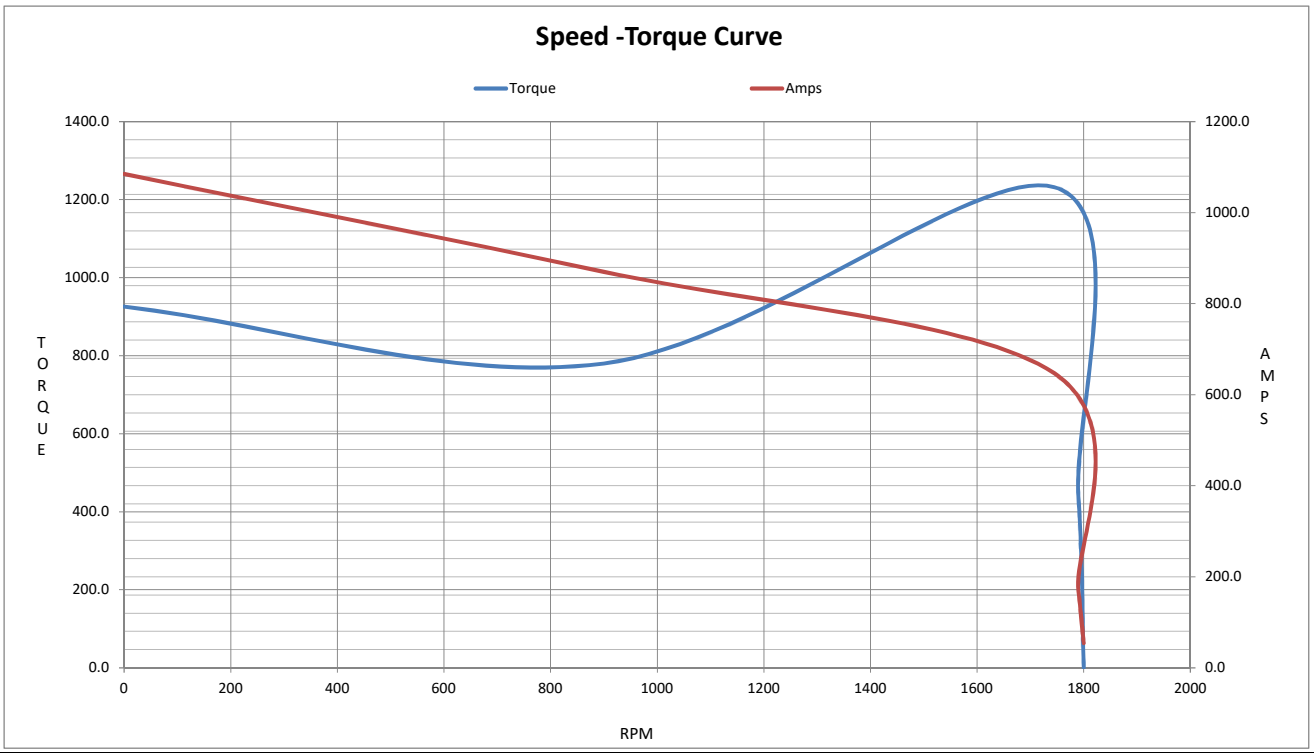
Additional Specifications:

0

0

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0180	0.0090	0.1120	0.2310	4.9140



PRODUCT INFORMATION PACKET

Model No: 447TTFCD6038
Catalog No: GT1055A
200 HP General Purpose Motor, 3 phase, 1800 RPM, 460 V, 447T Frame, TEFC
Three Phase TEFC Motors

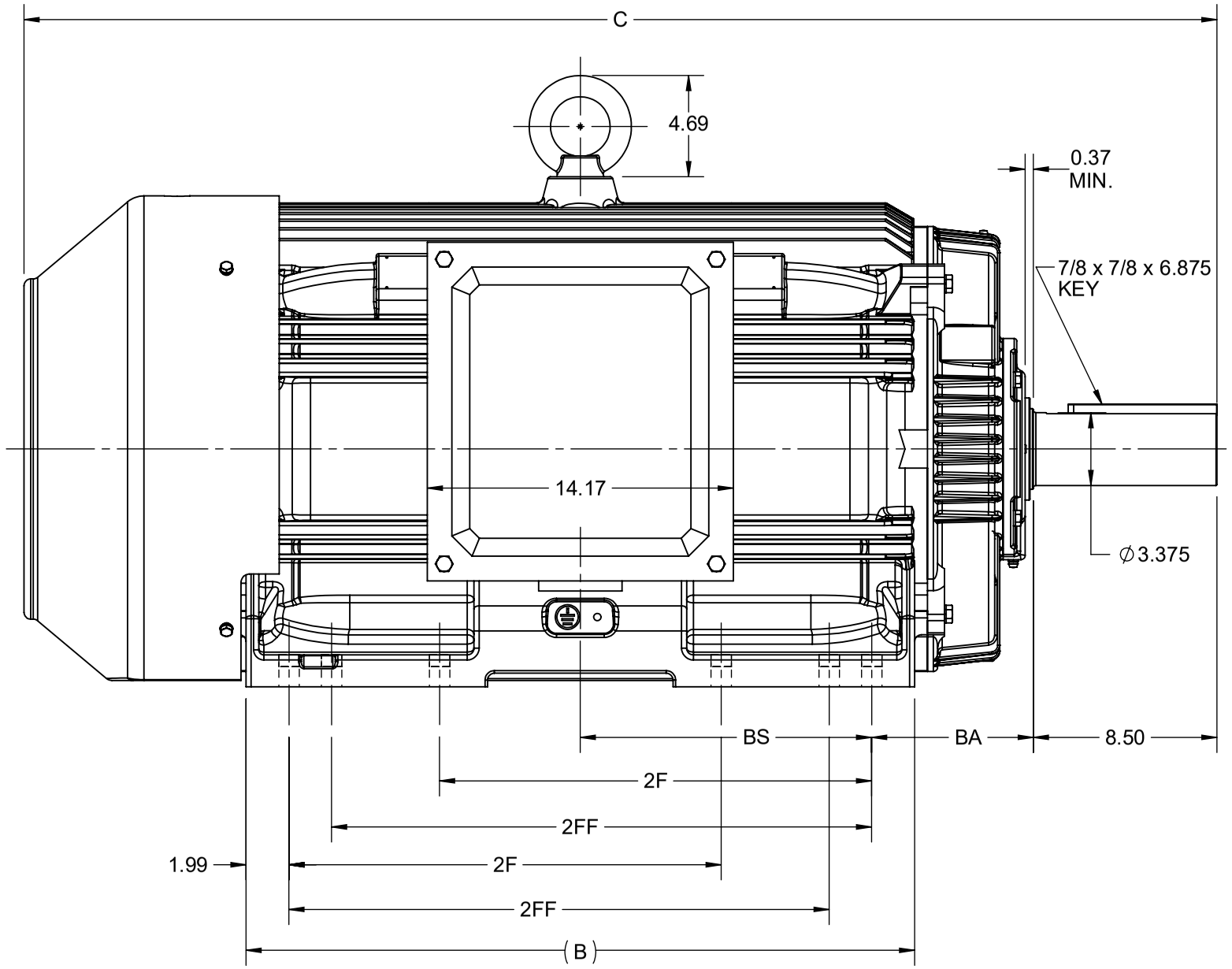
Nameplate Specifications

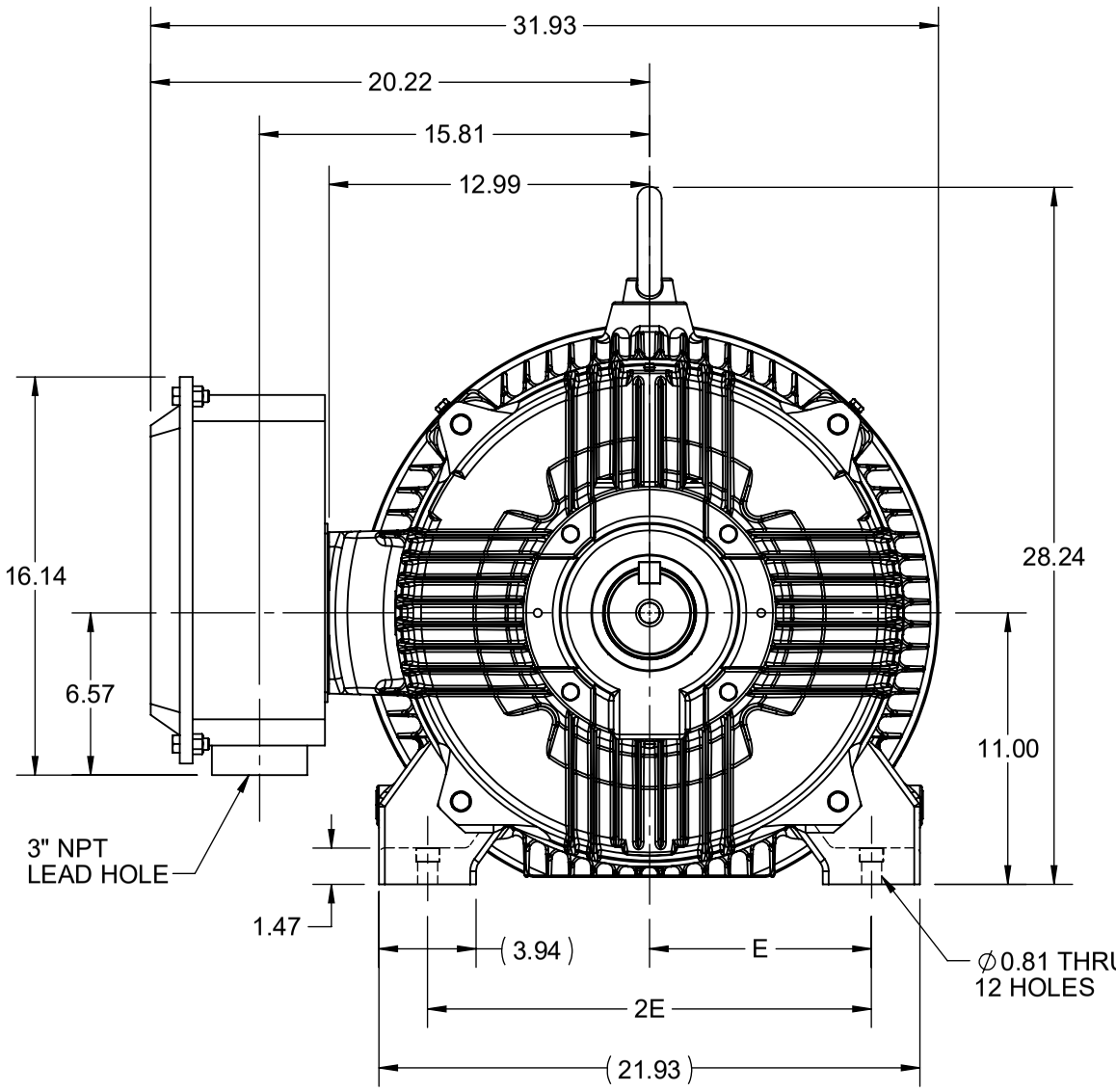
Output HP	**200 Hp**	Output KW	**149.0 kW**
Frequency	**60 Hz**	Voltage	**460 V**
Current	**219.0 A**	Speed	**1790 rpm**
Service Factor	**1.15**	Phase	**3**
Efficiency	**96.5 %**	Power Factor	**89**
Duty	**Continuous**	Insulation Class	**F**
Design Code	**B**	KVA Code	**G**
Frame	**447T**	Enclosure	**Totally Enclosed Fan Cooled**
Thermal Protection	**No**	Ambient Temperature	**40 °C**
Drive End Bearing Size	**6319**	Opp Drive End Bearing Size	**6317**
UL	**Listed**	CSA	**Y**
CE	**Y**	IP Code	**55**
Hazardous Location	**DIVISION 2 T2B**		

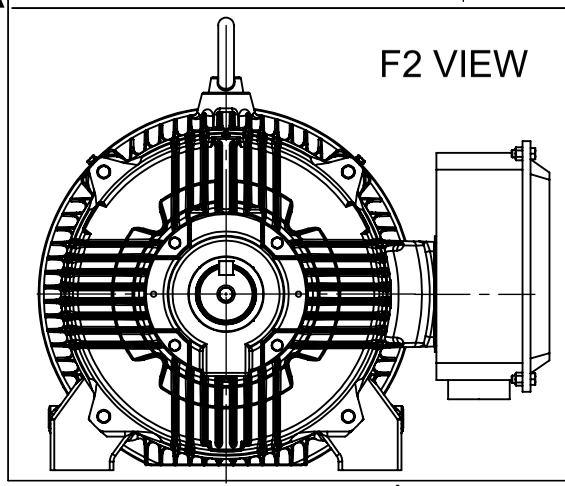
Technical Specifications

Electrical Type	**Squirrel Cage Inverter Rated**	Starting Method	**Part Wdg Start Or Inverter**
Poles	**4**	Rotation	**Selective Clockwise**
Resistance Main	**.0184 Ohms**	Mounting	**Rigid Base**
Motor Orientation	**Horizontal**	Drive End Bearing	**Ball**
Opp Drive End Bearing	**Ball**	Frame Material	**Cast Iron**
Shaft Type	**T**	Overall Length	**55.21 in**
Shaft Diameter	**3.375 in**	Shaft Extension	**8.5 in**
Assembly/Box Mounting	**F1/F2 CAPABLE**		
Connection Drawing	**EE7341C**	Outline Drawing	**SS557013**

B	C	E	2E	2F	2FF	BA	BS	MOUNTING
30.94	55.21	9.00	18.00	20.00	25.00	7.50	13.48	F1 OR F2







DRAWING REVISION	REVISION BY	REV DATE/© DATE
D	BISWA	13/01/2021
ECO	APPROVED BY	DATE
CR-0000557	GNK	13/01/2021
ECO DESCRIPTION		
DRAWING UPDATED		

PRIMARY DIMENSIONS ARE INCH
mm DIMENSIONS IN [BRACKETS]
ARE FOR REFERENCE ONLY

DRAWN BY	NIV
DATE	23/05/2016
APPROVED BY	SBD
DATE	23/05/2016
REFERENCE	

REGAL® Regal Beloit America, Inc.

DESCRIPTION
OUTLINE
447/449T FR-TEFC

MATERIAL | PROCESS/FINISH

THIRD ANGLE PROJECTION

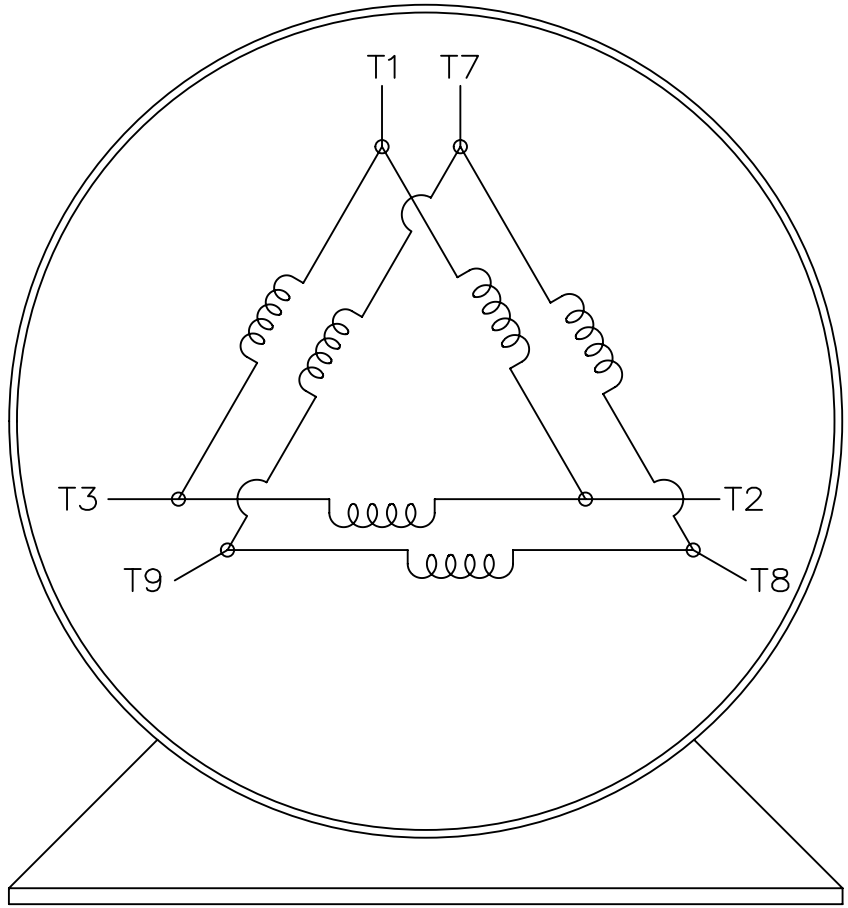
SIZE	DRAWING NUMBER	SHEET
B	SS557013	1 OF 1

EE7341C

THREE PHASE – PART WINDING START
DELTA – 6 LEADS

START
CONNECT T1 TO LINE 1
CONNECT T2 TO LINE 2
CONNECT T3 TO LINE 3
T7–T8–T9 OPEN

RUN
CONNECT T1&T7 TO LINE 1
CONNECT T2&T8 TO LINE 2
CONNECT T3&T9 TO LINE 3



VIEW OF TERMINAL END

IF MOTOR HAS 2 T'S

START
CONNECT T1,T1 TO LINE 1
CONNECT T2,T2 TO LINE 2
CONNECT T3,T3 TO LINE 3
T7,T7–T8,T8–T9,T9 OPEN

RUN
CONNECT T1,T1&T7,T7 TO LINE 1
CONNECT T2,T2&T8,T8 TO LINE 2
CONNECT T3,T3&T9,T9 TO LINE 3

NO.	REVISION	BY & DATE	CHK
E	NOTE ADDED FOR 2 T'S	NAR 17-12-2020	RC
D	RE–DRAWN WITH REGAL LOGO ECO–0110493	WGJ 09-30-2016	EMH

TOLERANCES UNLESS SPECIFIED

DEC.	INCHES
.X	± –
.XX	± –
.XXX	± –
.XXXX	± –
ANG	± –

REGAL – REGAL-BELOIT CORPORATION

TITLE: CONNECTION DIAGRAM 3Ø – 6 LEADS

MAT'L.

FINISH

CAD FILE EE7341C

RFP

DIST

DRAWN	BLR 03–09–1998
CHK	ML 03–23–1998
APPD	GK 03–23–1998
SCALE	1=1
REF	
FMF	
PREV	

SIZE A | DRAWING NO. EE7341C | PAGE OF | REV. E

CERTIFICATION DATA SHEET

Model#:	447TTFCD6038 AA	**WINDING#:**	HE32804009 NONE 1
CONN. DIAGRAM:	EE7341C	**ASSEMBLY:**	F1/F2 CAPABLE
OUTLINE:	SS557013		

TYPICAL MOTOR PERFORMANCE DATA

HP	KW	SYNC. RPM	F.L. RPM	FRAME	ENCLOSURE	KVA CODE	DESIGN
200&150	149&112	1800	1790&1490	447T	TEFC	G	B

PH	Hz	VOLTS	FL AMPS	START TYPE	DUTY	INSL	S.F	AMB°C	ELEVATION
3	60/50	460#380	219&200	PWS OR INVERTER	CONTINUOUS	F7	1.15/1.15	40	3300

FULL LOAD EFF: 96.2&96	3/4 LOAD EFF: 96.2	1/2 LOAD EFF: 95.4	GTD. EFF	ELEC. TYPE	NO LOAD AMPS
FULL LOAD PF: 89&88.5	3/4 LOAD PF: 86.5	1/2 LOAD PF: 79.5	95.8	SQ CAGE INV RATED	69

F.L. TORQUE	LOCKED ROTOR AMPS	L.R. TORQUE	B.D. TORQUE	F.L. RISE°C
587 LB-FT	1450	1256 LB-FT 215	1656 LB-FT 285	60

SOUND PRESSURE @ 3 FT.	SOUND POWER	ROTOR WK^2	MAX. WK^2	SAFE STALL TIME	STARTS /HOUR	APPROX. MOTOR WGT
80 dBA	90 dBA	88 LB-FT^2	- LB-FT^2	25 SEC.	-	2675 LBS.

*** SUPPLEMENTAL INFORMATION ***

DE BRACKET TYPE	ODE BRACKET TYPE	MOUNT TYPE	ORIENTATION	SEVERE DUTY	HAZARDOUS LOCATION	DRIP COVER	SCREENS	PAINT
STANDARD	STANDARD	RIGID	HORIZONTAL	FALSE	DIVISION 2 T2B	FALSE	NONE	BLUE (ENAMEL)

BEARINGS		GREASE	SHAFT TYPE	SPECIAL DE	SPECIAL ODE	SHAFT MATERIAL	FRAME MATERIAL
DE	OPE						
BALL 6319	BALL 6317	POLYREX EM	T	NONE	NONE	1045 HOT ROLLED (C-204)	CAST IRON

THERMO-PROTECTORS				THERMISTORS	CONTROL	SPACE /n HEATERS
THERMOSTATS	PROTECTORS	WDG RTDs	BRG RTDs			
NONE	NOT	NONE	NONE	NONE	FALSE	NONE VOLTS

If Inverter equals NONE, contact factory for further information

INVERTER TORQUE: VARIABLE 10:1
INV. HP SPEED RANGE: NONE

ENCODER: NONE
NONE NONE
NONE NONE PPR

BRAKE: NONE NONE
NONE P/N NONE
NONE NONE
NONE FT-LB NONE V NONE Hz

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DATE: 07/03/2017 02:13:48 AM
FORM 3531 REV.3 02/07/99
** Subject to change without notice.

Data Sheet

Date: 1/28/2019
Customer:
Attention:
Submitted by: FAREEDA DUDEKULA

447TTFCD6038

Submittal

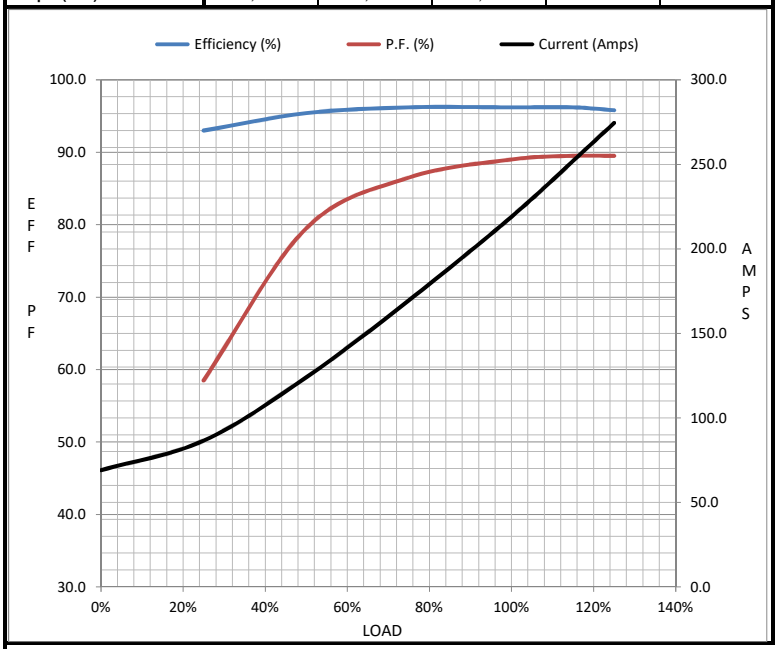
Data @ 460 V

Motor Load Data

Load	0%	25%	50%	75%	100%	115%	125%	LR	
Current (Amps)	69.0	86.5	124	170	219	252	275	1,450	
Torque (ft-lb)	0.00	146	293	440	587	676	735	1,256	
RPM	1800	1798	1795	1792	1790	1,788	1788	0	
Efficiency (%)		93.0	95.4	96.2	96.2	96.2	95.8		
P.F. (%)	4.5	58.5	79.5	86.5	89.0	89.5	89.5	38.0	

Motor Speed Data

	LR	Pull-Up	BD	Rated	Idle
Speed (RPM)	0	900	1750	1790	1800
Current (Amps)	1,450	1,160	815	219	69.0
Torque (ft-lb)	1,256	1,050	1,656	587	0.00



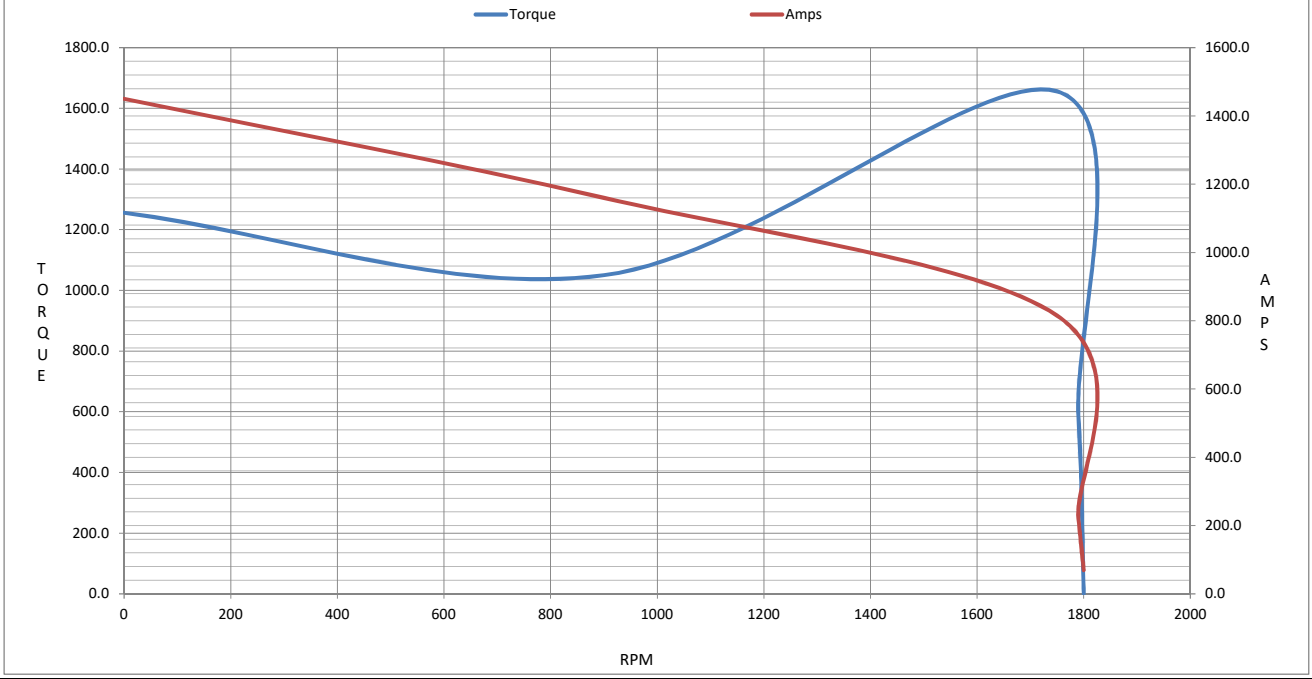
Information Block

HP	200.0	
Sync. RPM	1800	
Frame	447	
Enclosure	TEFC	
Construction	TFC	
Voltage	460#380	V
Frequency	60	Hz
Design	B	
LR Code letter	G	
Service Factor	1.15	
Temp Rise @ FL	60	° C
Duty	CONT	
Ambient	40	° C
Elevation	3,300	feet
Rotor/Shaft wk²	88.0	Lb-Ft²
Ref Wdg	HE32804009 NONE	
Sound Pressure @ 1M	80	dBA
VFD Rating	CONSTANT 10:1/VARIABLE 10:1	
Outline Dwg	SS557013	
Conn. Diag	EE7341C	
Additional Specifications:		
0		
0		

EQUIV CKT (OHMS / PHASE)

R1	R2	X1	X2	Xm
0.0120	0.0070	0.0810	0.1850	3.8340

Speed -Torque Curve



Pathfinder Systems Sound Enclosure Installation Skeletal Tube

STARTS ON PAGE: 3

Sound Enclosure and Fan Installation

STARTS ON PAGE: 51

Pathfinder Fan motor manual 2021

STARTS ON PAGE: 114

Sound Enclosure Instructions

March 2014

Safety Disclaimer

- Always work safely when installing metal products and use extreme caution on the roof at all times.
- Wear gloves and safety glasses to reduce the risk of injury, and use hearing protection when operating power tools.
- Many of the panels are extremely heavy and awkward. Adhere to safe lifting procedures to avoid physical injury.
- Always be sure that ladders are safely positioned and properly secured.
- Safety harnesses or other special equipment may be required; be sure to consult OSHA guidelines for compliance with all safety requirements.
- Do NOT walk on panels until all the fasteners are installed. Metal roofing panels are slippery when wet, dusty, frosty, or oily -- Do NOT attempt to walk on a metal roof under these conditions.
- Wear soft-soled shoes to improve traction and to minimize damage to the paint finish (if applicable).

Before you Begin

Thank you for purchasing a sound enclosure.This manual provides general instructions to assemble or disassemble your sound enclosure. It is not specific to your unit and should be used as a guideline only.

Tools Required

You will need 3-4 people for installation and the following tools:
Forklift and fork extensions
Ladder or Similar
Pneumatic Air Driver
Various size Socket Drivers

Parts List

The sound enclosure has the following parts for each enclosure:

- 1/2-13 x 7" Bolts, nuts and washers
- Silicone Caulk
- 3/16” Self Drilling Screws for Fan
- Roof Panels
- Door Panels
- Air Box End Panel(s)
- End Panel(s)
- Wall Panel(s)
- Fan

Each panel is numbered. Where it meets another panel it is labeled with the same number so you would match 1 to 1, 2 to 2, etc.

Use the following pictures of the assembled enclosure to familiarize yourself with the different panels and how they fit together.

Assembly Instructions

The following is a guideline you can use to safely install the panels. You may decide to build the panels in a different sequence; however this is what we recommend. The pictures are not specific to your unit.

You will need at least 1-2 people for the next steps. If your unit came from the factory unassembled, each panel is numbered. Where it meets another panel it is labeled with the same number so you would match 1 to 1, 2 to 2, etc. The labels are removable and can be easily removed after assembly.

1. Locate (2) wall panels. Stand upright to form a corner. If provided, use silicone caulk between the panels.
2. Position one person inside and one outside. Use 1/2-13 x 7" bolts, nuts and washers to fasten the panels together.

3. Locate the next wall panel. Stand upright. If provided, use silicone caulk between the panels.
4. Use 1/2-13 x 7" bolts, nuts and washers to fasten the panels together.

5. Continue until you have fastened all wall panels together. You should have the entire bottom together. Now you will assemble the top.

6. Use a forklift and chains to lift a Roof Panel into place. The roof panels only fit one way so make sure you match the numbers on the corresponding wall panel.

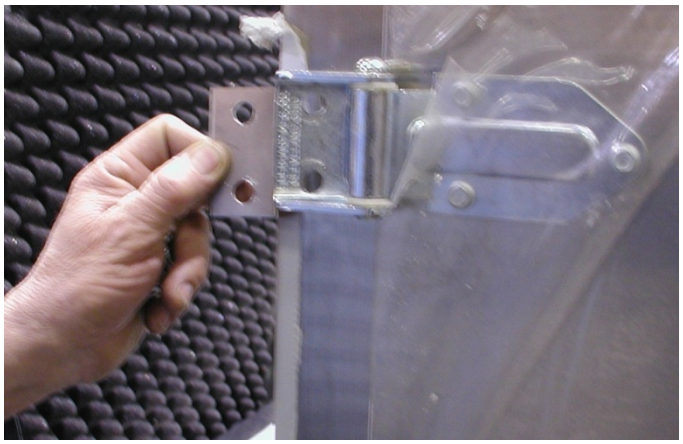
7. If provided, use the silicone caulk between the roof panels and between the roof and the wall panels.
8. Use 1/2-13 x 7" bolts, nuts and washers to fasten the roof panels to the wall panels.

9. If necessary, install the doors. Depending on what type of hinge you have, you may have to fasten the bolts. Welded hinges allow for the door to lift off and on.

   Do not lose the washers that come with the hinges or your doors will not work properly.

Bolt Hinges

Weld Hinges



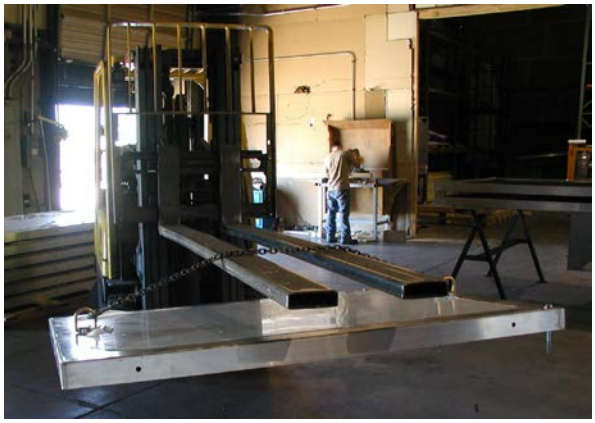
10. Use a forklift to lift the fan on to the roof.
11. Use 1/8” self-tapping screws to secure the fan to the bracket on the Roof.
12. Have a certified electrician wire the fan and your sound enclosure is complete!

Knock Down Instructions

You will need at least 1-2 people for the next steps.
The following is a guideline you can use to safely take apart the sound enclosure.

1. Have a certified electrician remove power from the fan/unit.
2. Remove 1/8” self-tapping screws that secure the fan to the bracket on the Roof. If necessary, use a forklift to remove the fan.
3. Position one person inside and one outside. Remove 1/2-13 x 7" bolts, nuts and washers from the Roof. The nuts can be accessed from inside the unit.

4. Use a forklift and chains to remove the Roof Panel. It only fits one way so you might want to note how it is installed. There may be silicone caulk between the roof and top of the panels.

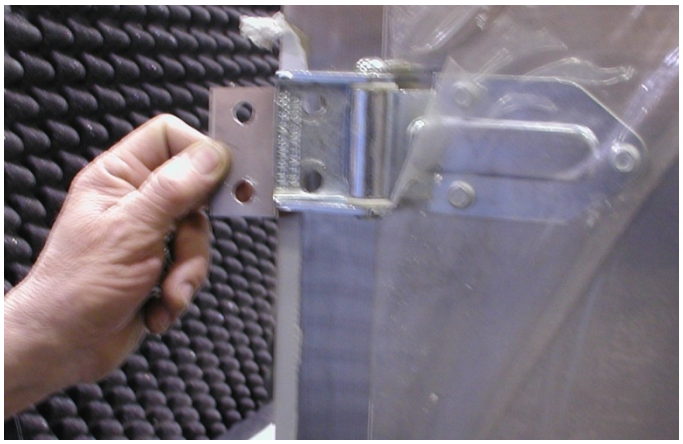


5. Remove the doors. Depending on what type of hinge you have, you may have to remove some bolts. Welded hinges lift off.

   Do not lose the washers that come with the hinges or your doors will not work properly.

Bolt Hinge and Washer

Weld Hinge and Washer



6. Position one person inside and one outside. Remove 1/2-13 x 7" bolts, nuts and washers that fasten the panels together. There may be silicone caulk between the roof and top of the panels.

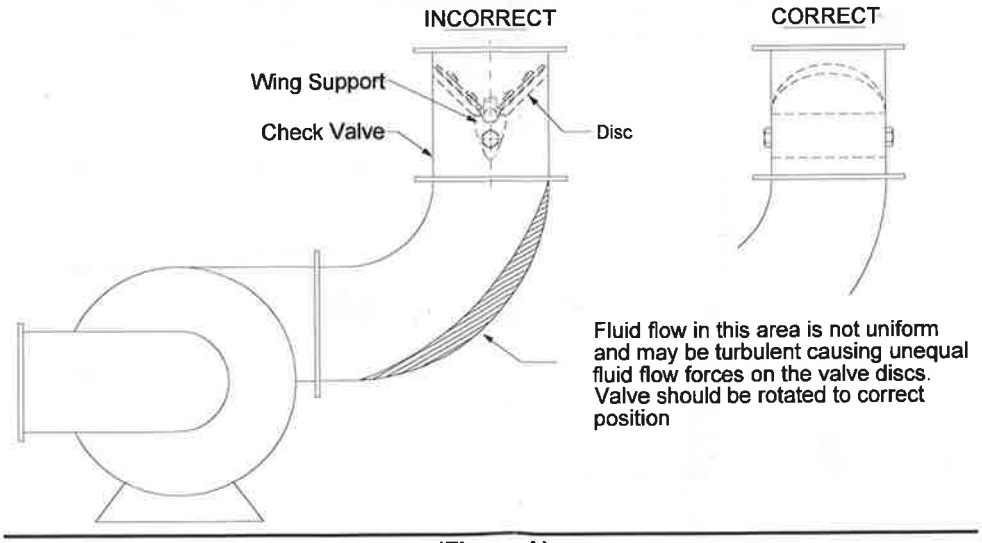
7. Continue until you have taken apart all panels.

U.S. VALVE
812-E Oregon Avenue
Linthicum, Maryland 21090
tel (410) 789 0999
fax (410) 789 1009

INSTALLATION INSTRUCTIONS

VALVE INSTALLATION:

1. Remove check valve from packaging and inspect for any shipping damage or loose fasteners. All fasteners have been set with Loctite®. If damaged in shipping, save original box and box contents.
2. If check valve is to be painted or insulated, record the US Valve data on the valve identification tag.
3. If valves are being stored, they should be in a weather-protected area, preferably indoors.
4. Open and close the discs of your valve a few times by hand to assure freedom of movement.
5. **The flow arrow** on your valve indicates the direction of flow upon installation.
6. Use only a **strap type wrench** for installation to prevent distortion of the valve body.
7. The check valve is **not suitable for use on a discharge** of reciprocating compressors. Pulsating and cyclic flow will damage the valve.
8. **If this valve is installed in a horizontal line,** make sure the screws protruding through the top and bottom of the valve body are in the vertical position. Maintain at least 6 pipe diameters of straight length of piping between the check valve and any other line restriction, i.e. elbows, tees, valves, etc.
9. **If the valve installation is in a vertical line with upward flow,** the position of the wing support is not important. There should be at least 6 pipe diameters of straight unrestricted piping upstream and downstream of the check valve. If space conditions do not allow for this, the valve must be installed so that the flow is equally distributed across the two valve discs *(see figure A below).*



(Figure A)

FOR REPLACEMENT OF INTERNALS, SEE REVERSE SIDE →

PARTS REPLACEMENT INSTRUCTIONS

COMPLETE REPLACEMENT OF VALVE INTERNALS:

1. Carefully remove valve from pipeline. **USE ONLY A STRAP TYPE WRENCH.**
2. Hold the valve body in your hand or in a suitable vise to prevent distortion of the valve body. **NOTE: DO NOT EXERT UNDO FORCE ON THE VALVE BODY.** This may permanently effect the valve operation.
3. Remove all valve internals by unscrewing the Wing Support screws *(see Figure 1 below)* and any other body support rods such as travel stop rods (only on large size valves).

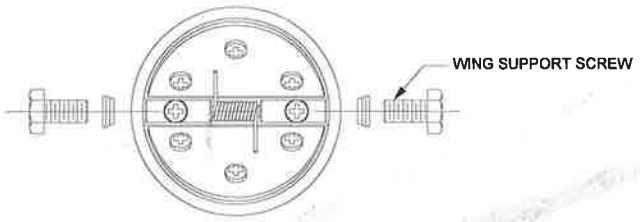
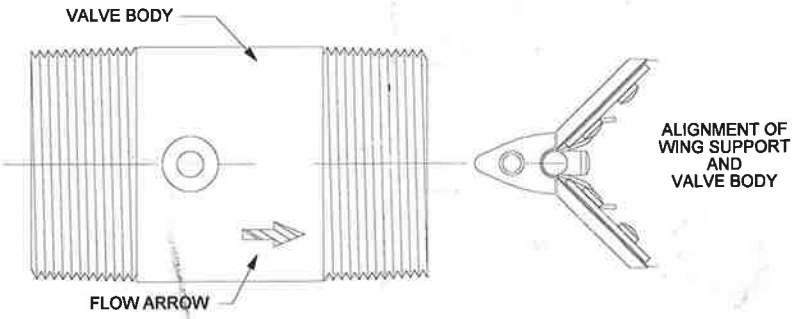


FIGURE 1

4. Inspect the body inside diameter to determine if the body is suitable and retains its original integrity i.e. surface finish is good and roundness apparent.
5. If valve body appears satisfactory and needs only minor cleanup, the valve is then suitable to replace the internals. **DO NOT SANDBLAST OR OTHERWISE DAMAGE THE VALVE BODY'S INNER SURFACE.**
6. Make sure when you order complete internal replacement assemblies that the new assemblies are identical to the original internals. Always reference your check valve's unique serial number when ordering replacements.
7. **Install the new assembly:**
   (a) Put some water on the elastomer seal to act as a lubricant when installing the new wing support assembly into the valve body.
   (b) Make sure you assemble the wing assembly correctly with the direction of flow.
   (c) Align the wing support mounting screw holes and the valve body screw holes properly. *(See Figure 2).*



(Figure 2)

   (d) Push wing support assembly into the valve body until the holes line up properly. If you overshoot the hole alignment by half the screw hole diameter, just push the wing support assembly completely through the valve body and repeat the procedure.
   (e) When installing the wing support mounting screws, make sure you install a new Nylite® pressure seal and apply a sufficient amount of Loctite® #272 to the screw threads. The wing support screws should be torqued to 8-ft-lbs for ¼-20 screws and 48 in-lbs for 10-32 screws. Never over tighten screws.
   (f) Allow Loctite® to dry 20 minutes, full cure in 24 hours.

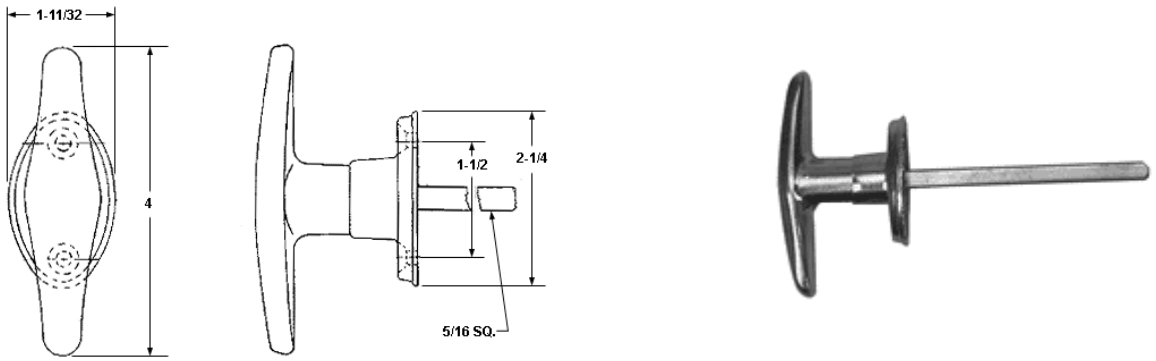
Sound Enclosure Hardware

Bill of Materials

Description	Part Number	Typical Qty
Handle	GD206	4
Rod	5611-5-48	8
Center for Rod	5611	4
Lifting Lugs	710-GZ	4
Bolt-On Hinge	5867	8
Convoluted Foam	PSI #618	N/A
Fan (Custom Sized)	Consult your quote	1
Grab Handle (Optional)	TH555	4
Weld Hinge, Lift Off Doors (Optional)	R194-0135AL	8

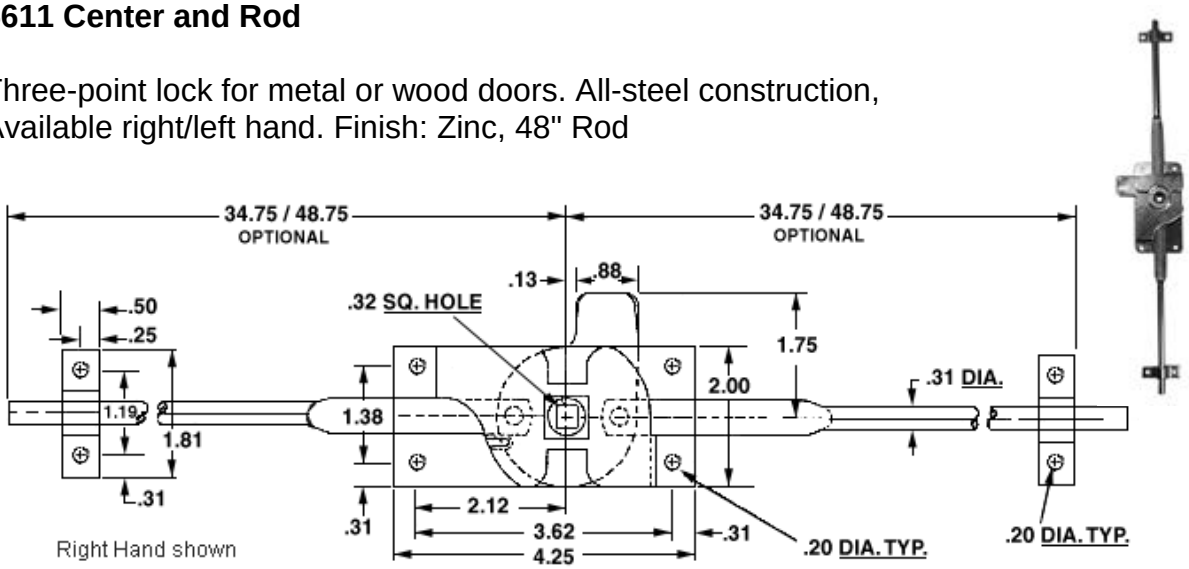
GD206 Handle

Plain 'T' Handle, with 4" shaft, 5/16 in. sq. 1-1/2"
center to center mounting plate. Finish: bright chrome.



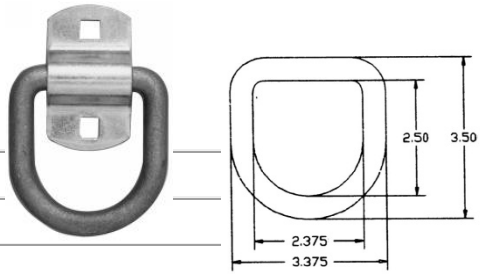
5611 Center and Rod

Three-point lock for metal or wood doors. All-steel construction,
Available right/left hand. Finish: Zinc, 48" Rod



710-GZ Lifting Lug

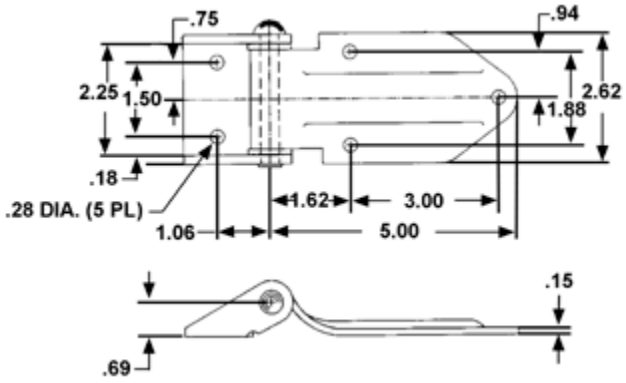
Tie down ring with bolt-on clip, gold zinc finish

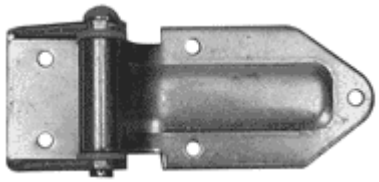


Finish	Gold Zinc
Length	3-1/2"
Width	3-1/4"
Material	Steel
Diameter	1/2"
Breaking Strength	12,000 lbs.

5867 Bolt-On Hinge

5" Stamped Steel Hinge for flush mounting, Five mounting holes, 9/32" dia. Has nylon sleeve bearings for easier operation. Door movement 180 degrees.
7 gauge steel butt. 9 gauge steel strap.





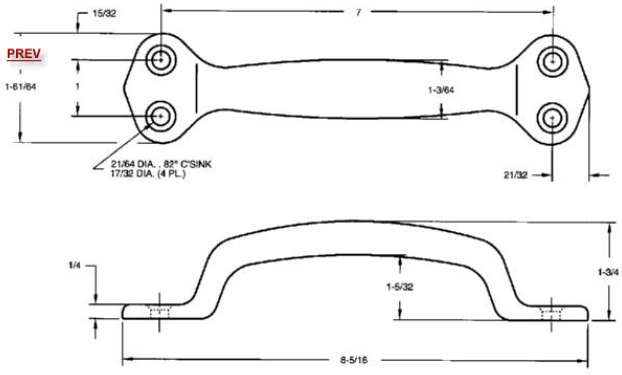
R194-0135 Weld-On Hinge (Optional)

Weld-On Hinge, Lift off type, Aluminum, with a Stainless Steel Pin and Bearing Washer.

Length	5-1/4"
Material Thickness	13/16"
Pin Diameter	15/32"

TH555 Grab Handle (Optional)

Chrome plated, Solid die-cast, 8-15/16" overall length, 125/32" overall height, (4) #14 mtg. holes for oval head screws on 7" x 1" centers, 15/32" inside grab handle height



Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

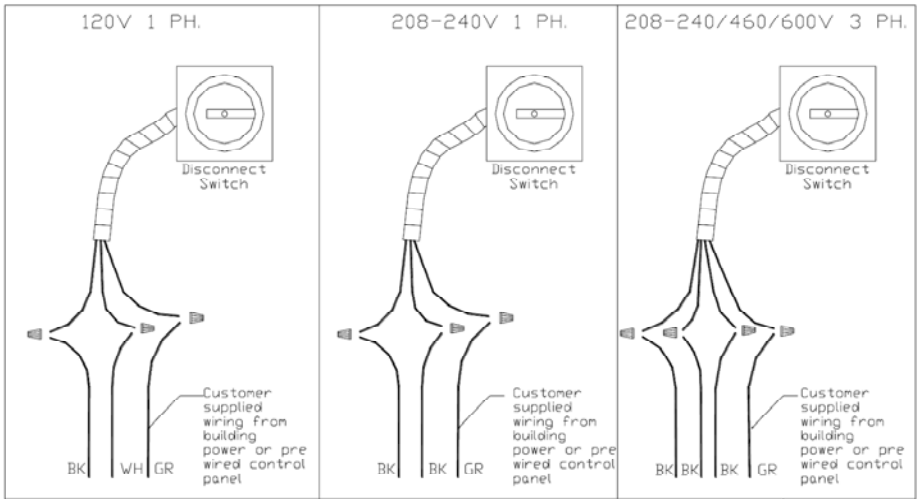
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.

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WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at **1-866-784-6900** for warranty and technical support issues.

Mechanical

WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.
5. Inline fans can be interior mounted, motors shall be located outside of the exhaust airstream.
6. Interior mounted fans must have a grease drain that is piped to an approved grease reservoir.
7. Interior mounted fans are considered part of the duct system. Clearance to combustibles must be maintained are all time. If needed the fan may be wrapped to maintain the duct system fire rating.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. If a backdraft damper is required, it should be secured within the curb using sheet metal screws, to the bottom of a damper box or damper support flanges located below the roof deck. **CAUTION: NFPA-96 RECOMMENDS THAT DAMPERS SHOULD NOT BE INSTALLED WHEN EXHAUSTER IS USED FOR REMOVAL OF SMOKE AND GREASE LADEN VAPORS FROM COMMERCIAL KITCHEN EQUIPMENT. CONSULT STATE AND LOCAL CODES FOR DETAILED REQUIREMENTS.**
3. If an up-blast fan is used for kitchen hood exhaust, ensure discharge is at least 40 inches above the roof surface in accordance with NFPA96.
4. On an up-blast fan, normally the power cord is brought through the conduit tube located on the top skirt on the outside of the unit.
5. Secure ventilator curb through vertical portion of the ventilator base assembly flange using a minimum of eight (8) lug screws, anchor bolts, or other suitable fasteners (not furnished).
6. Before connecting fan motor to power source verify power line wiring is de-energized.
7. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
8. Before powering up fan check ventilator wheel for free rotation.
9. Check all fasteners for tightness.
10. Re-install motor dome.
11. A drain pipe is provided for single-point drainage of water and residue on up-blast fans. The drain pipe should be positioned towards the roof slope. Some means for collection of this residue must be provided, either a container directly under the trough or use of an adapter and pipe to carry the residue to a remote collection point. An optional down spout and grease collection box is available as an accessory item for up-blast fans.

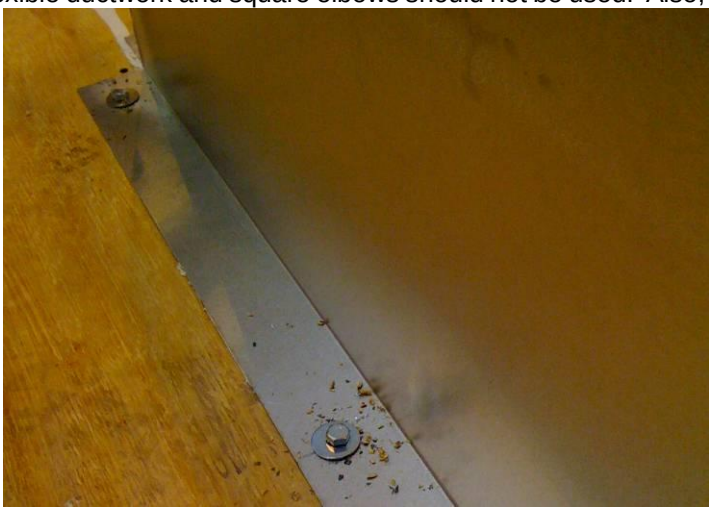
Wall Mounting

1. The same instructions, warnings and notes found under Roof Mounting section will apply. Refer to steps 2 and 3, and steps 5 through 8.
2. **Masonry Wall:** Around the wall opening install an angle iron frame at least 2" x2" x ¼". Frame should be approximately 1/2" smaller than the inside base dimension of the ventilator. Secure the lead cinch type anchors with non-ferrous bolts (3 per side). The ventilator should be mounted to the mounting angle with self-taping sheet metal screws (3 per side).
3. **Wood Sidings:** Around the wall opening install a wooden frame 2" high x 2" wide. Frame should be approximately 1/2" smaller than the inside base dimension of the ventilator. Secure with counter-sunk expansion type lag bolts (3 per side). The ventilator should then be mounted to the mounting frame with the square head wood screws (3 per side) 3/8" minimum.
4. Steel wall mount brackets are also available as a factory option for the fan.
5. The mounting flange connections should be coated with a suitable caulking compound or an approved waterproof mastic sealer.
6. Wall mount application is not recommended from fans with wheels 30" or larger.

IMPORTANT: OSHA REGULATIONS REQUIRE THE VENTILATOR TO BE MOUNTED AT LEAST EIGHT (8) FEET ABOVE GROUND OR FLOOR LEVEL.

Curb and Ductwork

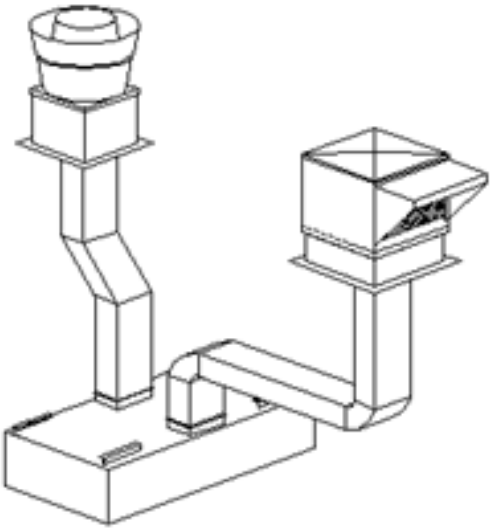
This fan was specified for a specific CFM and static pressure. The ductwork attached to this unit will significantly affect the airflow performance. Flexible ductwork and square elbows should not be used. Also, transitions and turns in ductwork near the fan inlet will cause system effect and will drastically increase the static pressure and reduce airflow. **Follow SMACNA guides and recommendations for the remaining duct run.** Fans designed for rooftop installation should be installed on a prefabricated or factory built roof curb. Follow curb manufacturer's instructions for proper curb installation. Curbs should be connected to structural roof members with at least four (3) lug screws, anchor bolts, or other suitable fasteners (not furnished) per curb flange. Curb flanges should be caulked to roof.



The fan should be installed on a curb and/or rail elevated not less than 14" above any surface. Be sure duct connection and fan outlet are properly aligned and sealed. Secure fan to curb through vertical portion of the ventilator base assembly flange using a minimum of eight (8) lug screws, anchor bolts, or other suitable fasteners (not furnished). Shims may be required depending upon curb installation and roofing material. Check all fasteners for tightness. The diagrams below show different mechanical installation configurations.

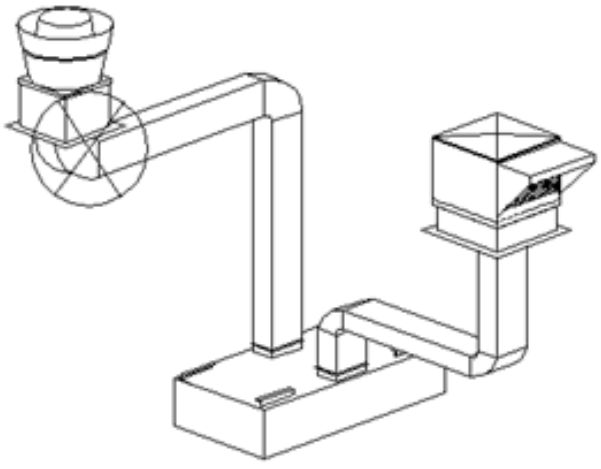
Duct Routing Examples

Proper Duct Routing

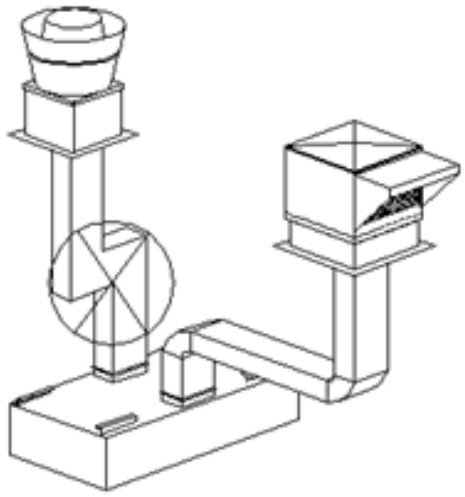


If duct cannot go straight up
use offsets

Improper Duct Routing

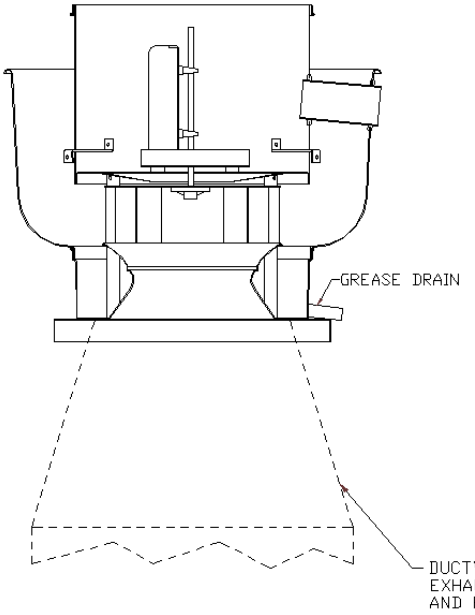


DO NOT connect Elbow DIrecty
to Fan Inlet.



DO NOT use square elbows

Up-Blast Roof Mount Installation



FEATURES:

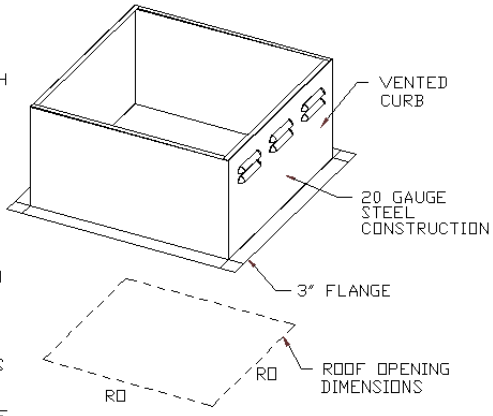
- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL762
- AMCA SOUND AND AIR CERTIFIED
- WIRING FROM MOTOR TO DISCONNECT SWITCH
- WEATHERPROOF DISCONNECT
- HIGH HEAT OPERATION 300°F (149°C)
- GREASE CLASSIFICATION TESTING

NORMAL TEMPERATURE TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

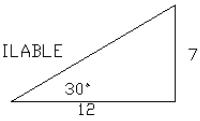
ABNORMAL FLARE-UP TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

OPTIONS:

GREASE BOX
HINGED FAN
PITCHED CURB
INSULATED CURB

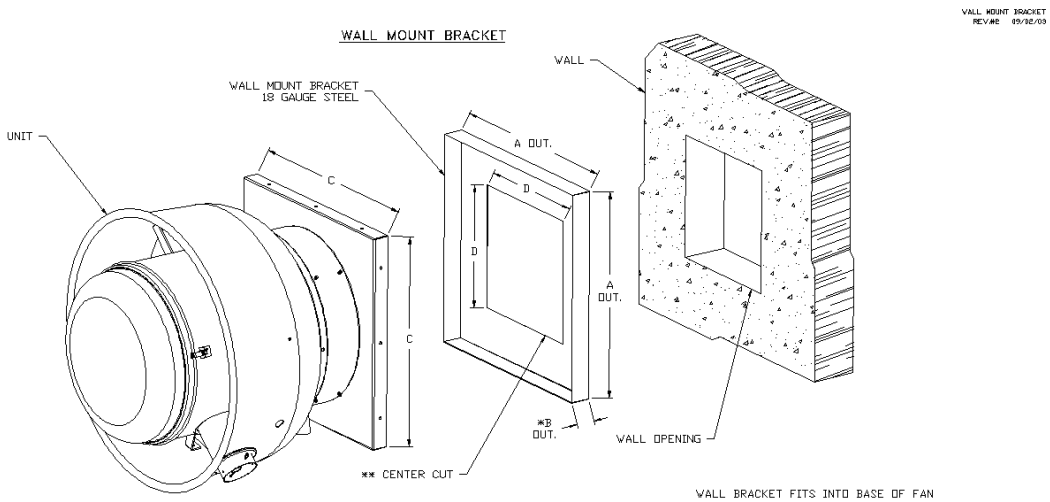


PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.



SPECIFY PITCH:
EXAMPLE: 7/12 PITCH = 30° SLOPE

Up-Blast Wall Mount Installation



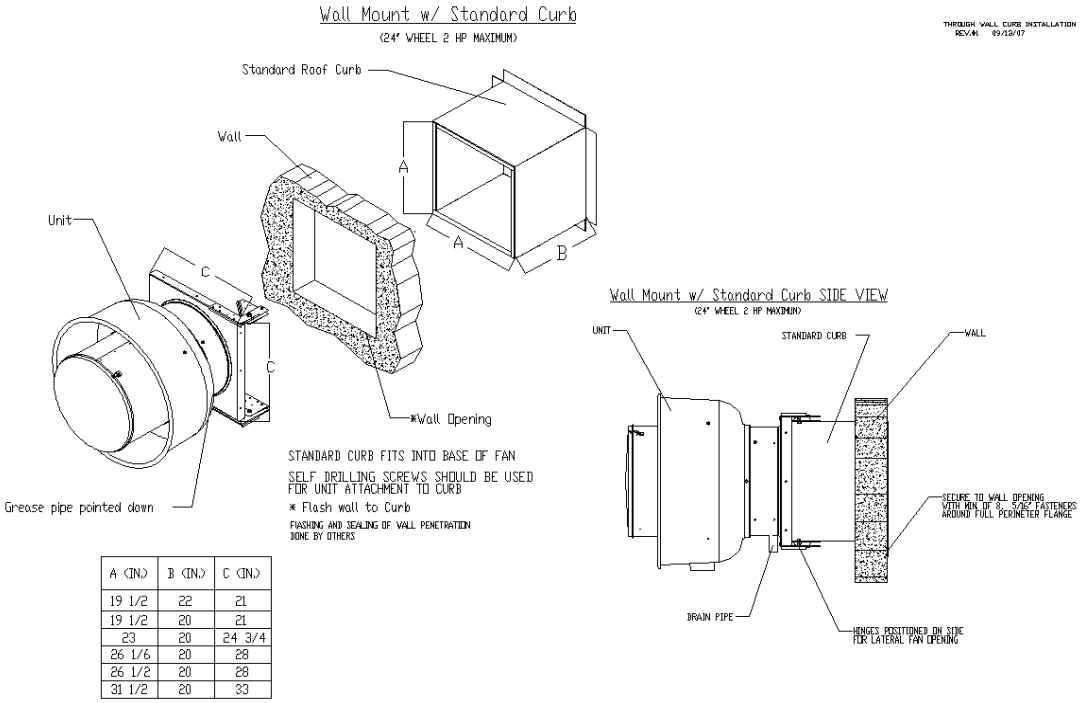
A OUT.	B OUT.	C	D
18 1/2	2	19	13
20 1/2	2	21	16
21 1/2	2	22	16
24 1/4	2	24 3/4	20
25 1/2	2	26	20
27 1/2	2	28	24
32 1/2	2	33	28

WALL BRACKET FITS INTO BASE OF FAN

SELF DRILLING SCREWS SHOULD BE USED FOR UNIT ATTACHMENT TO WALL MOUNT BRACKET

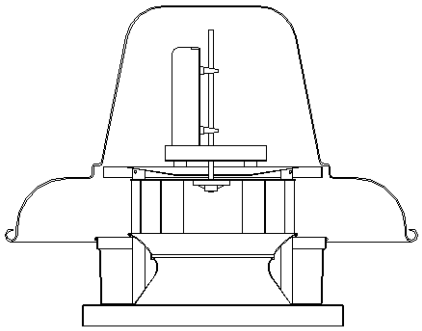
* "B" DIMENSION = 5" WHEN USED WITH DAMPER
** CENTERED IN WALL MOUNT

Up-Blast Through Wall Mount Installation



A (IN.)	B (IN.)	C (IN.)
19 1/2	22	21
19 1/2	20	21
23	20	24 3/4
26 1/6	20	28
26 1/2	20	28
31 1/2	20	33

Down-Blast Installation

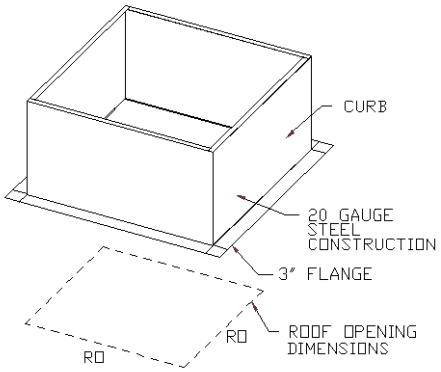


FEATURES:

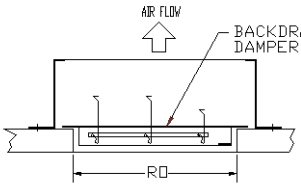
- ROOF MOUNTED FANS
- UL705
- AMCA SOUND AND AIR CERTIFIED
- WIRING FROM MOTOR TO DISCONNECT SWITCH
- DISCONNECT SWITCH
- STANDARD BIRD SCREEN

OPTIONS:

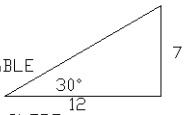
HINGED FAN
PITCHED CURB
INSULATED CURB
BACKDRAFT DAMPER



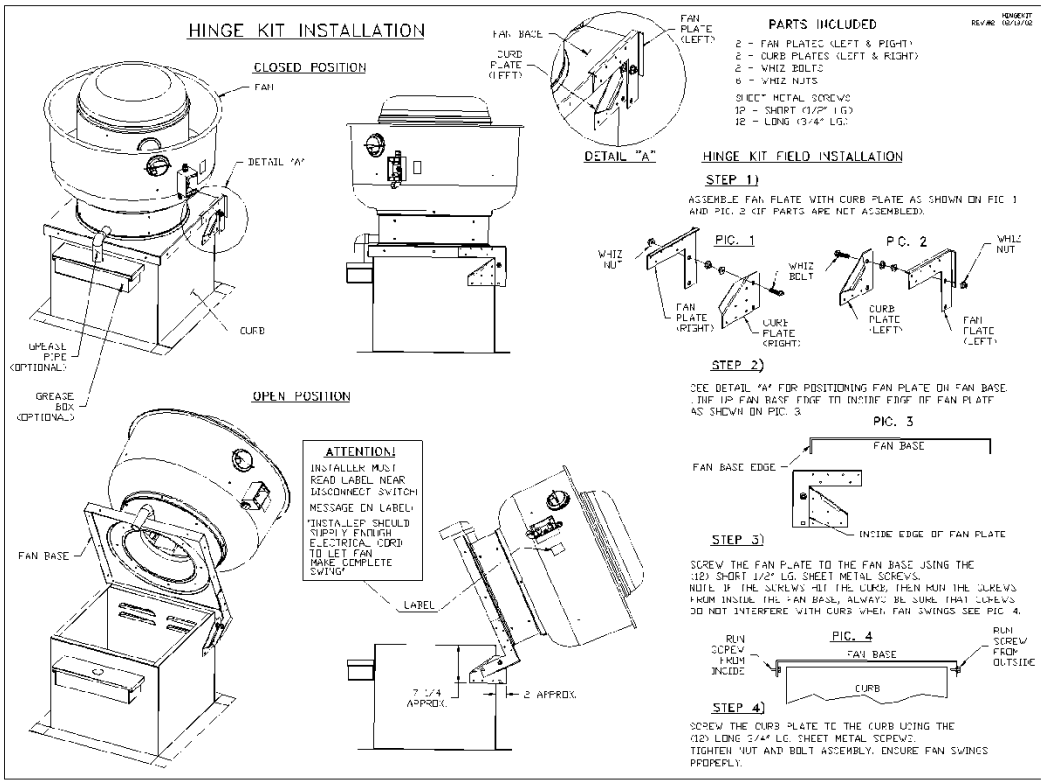
BACKDRAFT DAMPER INSTALLATION



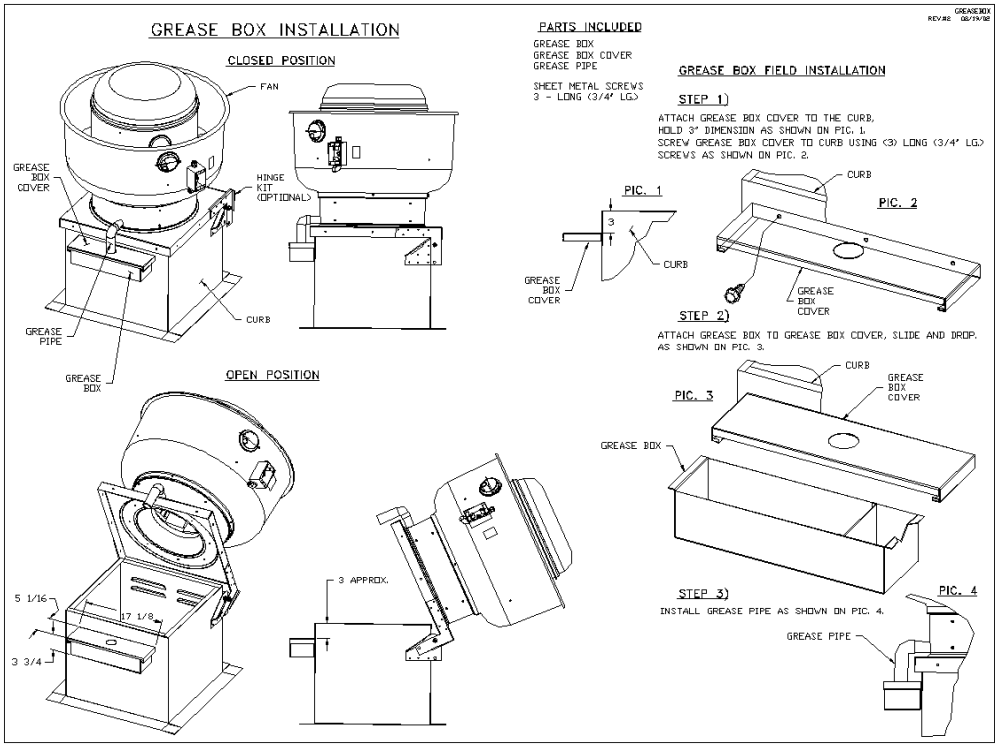
PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.
SPECIFY PITCH:
EXAMPLE: 7/12 PITCH = 30° SLOPE



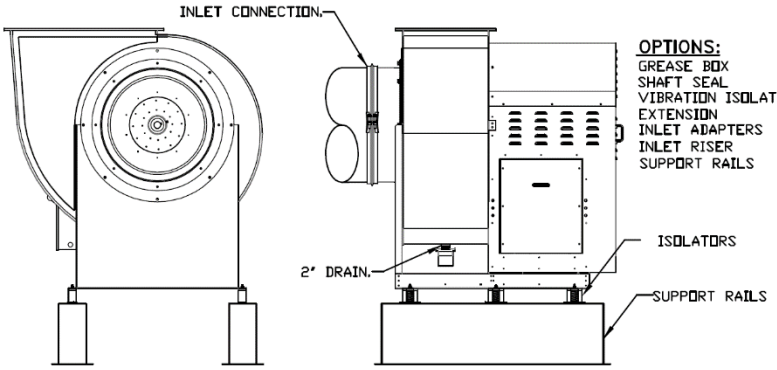
Typical Hinge Kit – Centrifugal Upblast



Typical Grease Box Installation

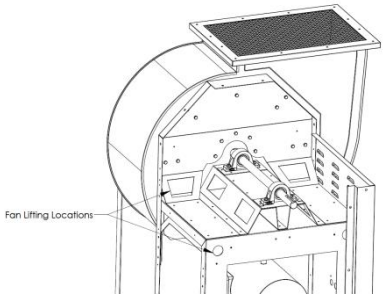


Up-Blast Utility Set Installation



OPTIONS:
GREASE BOX
SHAFT SEAL
VIBRATION ISOLATORS
EXTENSION
INLET ADAPTERS
INLET RISER
SUPPORT RAILS

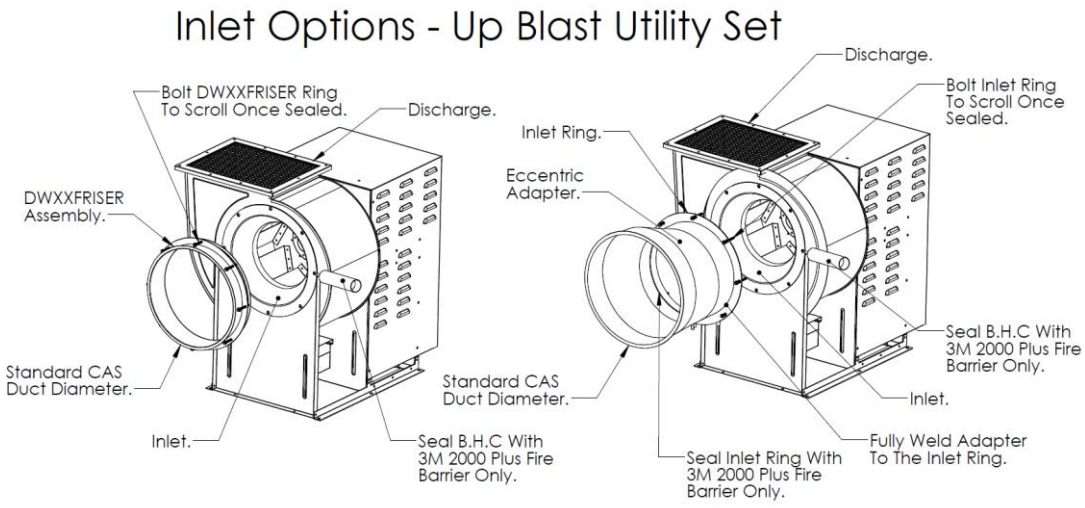
FEATURES:
- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL705
- UL762
- HIGH HEAT OPERATION DIRECT DRIVE 350°F (176°C)
- HIGH HEAT OPERATION BELT DRIVE 350°F (176°C)
- HEAT SLINGER
- GREASE CLASSIFICATION TESTING
- 2" DRAIN
- MOTOR WEATHER COVER
- FULLY SEALED SCROLL HOUSING
- SCROLL ACCESS DOOR
- FLANGE 1 1/4" - 11 THRU 20.
- FLANGE 2" - 24 THRU 36.



NORMAL TEMPERATURE TEST BELT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 350°F (176°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

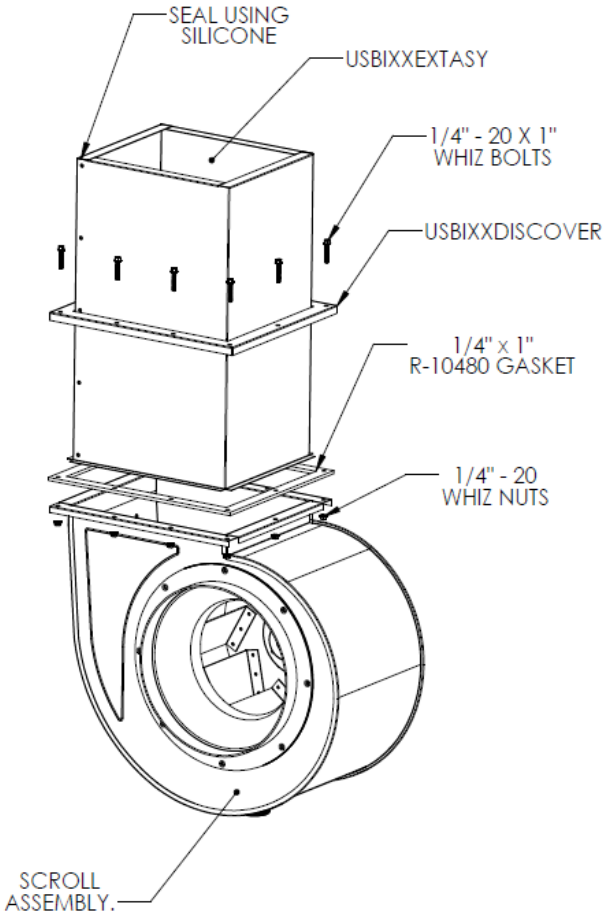
NORMAL TEMPERATURE TEST DIRECT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 350°F (176°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

Up-Blast Utility Set Inlet Options



Inlet Connections						
Fan Size	Duct Diameter	Inlet Connection	B.H.C.	Inlet Ring OD	Hardware #	Hardware Qty
11	12"	DW12FRISER	13.375"	12.500"	1/4" - 20 x 1 1/2" (92323A523)	8
13	14"	DW14FRISER	15.375"	13.500"	1/4" - 20 x 1 1/2" (92323A523)	8
15	16"	DW16FRISER	17.375"	15.250"	1/4" - 20 x 1 1/2" (92323A523)	8
18	20"	DW20FRISER	21.375"	18.500"	1/4" - 20 x 1 1/2" (92323A523)	8
20	20"	DW20FRISERUSBI20	22.375"	19.625"	1/4" - 20 x 1 1/2" (92323A523)	8
24	24"	DW24FRISERUSBI24	28.000"	25.375"	3/8" - 16 X 1 1/2" (92323A558)	8
30	24"	DW24FRISERUSBI30	26.962"	24.375"	3/8" - 16 X 1 1/2" (92323A558)	8
36	24"	DW307524ADPEC	N/A	30.500"	3/8" - 16 X 1 1/2" (92323A558)	8

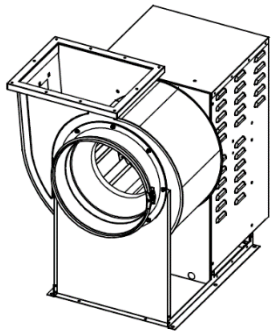
Discharge Extension Options - Up Blast Utility Set



Hardware Counts	
Hardware # Bolt / Nut	Hardware Qty
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	8
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	8
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	8
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	12
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	12
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	12
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	12
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	14

USBI - Discharge Extension					
Fan Size	Extension #	"L"	"W"	"H"	Cover #
11	USBI11EXTASY	12"	11"	24"	USBI11DISCOVER
13	USBI13EXTASY	14"	12"	24"	USBI13DISCOVER
15	USBI15EXTASY	16"	13"	24"	USBI15DISCOVER
18	USBI18EXTASY	19"	15"	24"	USBI18DISCOVER
20	USBI20EXTASY	21"	15"	24"	USBI120DISCOVER
24	USBI24EXTASY	26"	17"	24"	USBI24DISCOVER
30	USBI30EXTASY	32"	19"	24"	USBI30DISCOVER
36	USBI36EXTASY	39"	23"	24"	USBI36DISCOVER

Up-Blast Utility Set Indoor Installation



Some situations prevent the installation of exhaust fans on the roof or other outdoor location. An indoor installation may be the only alternative.

Of the various types of fans that might be employed, utility sets seem most appropriate because they readily accommodate the inlet and outlet duct connections. Fans designed for curb mounting would present outlet duct connection difficulties.

Most jurisdictions having authority comply IMC, NFPA96 and with UL762 standards. Standard UL762 “Power Roof Ventilators for Restaurant Exhaust Appliances”, covers the utility set high temperature and grease fire testing. NFPA96 “Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations”, covers the installation of the duct connections to the inlet and out of the exhaust fan.

Standard UL762:
This standard has two primary tests. The first test has the fan exhaust air for several hours at the maximum temperature the manufacturer wishes to list the fan, such as 300 degrees F. The second part imitates a grease fire by igniting grease in a pan near an inlet duct. If the fan keeps running and does not display any unsafe results it passes those tests. They also examine the fan for any characteristics that might be unsuitable.

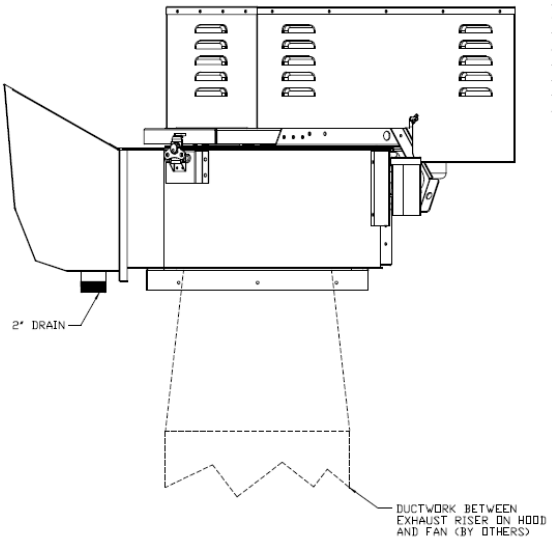
In the scope, section 1.1, it says “these requirements cover roof or wall-mounted ventilators for restaurant exhaust appliances”. It would seem at first that the phrase “roof or wall mounted” would preclude applicability of the label indoors. However, in the very next paragraph it goes on to say “Power ventilators…covered by these requirements are intended or installation in accordance with … NFPA 96”. NFPA 96 clearly defines how to install a traditional ventilator indoors.

Standard NFPA 96 – 8.1.4* Utility Set Exhaust Fans.
8.1.4.2 Utility set exhaust fans installed within the building shall be located in an accessible area of adequate size to allow for service or removal.
8.1.4.3 Where the duct system connected to the fan is in an enclosure, the space or room in which the exhaust fan is located shall have the same fire resistance rating as the enclosure.
8.1.4.4 The fan shall be connected to the exhaust duct by flanges securely bolted as shown in Figure 8.1.3.2 (a) through Figure 8.1.3.2 (d) or by a system specifically listed for such use, such as UL1978 or UL2221 listed duct systems.
8.1.4.5 Flexible connectors shall not be used.
8.1.4.6 Exhaust fans shall have a drain directed to a readily accessible and visible grease receptacle not to exceed 3.8 L (1 gallon).

Manufactures Recommendations for Indoor Installation:

1. The fan inlet and outlet must be connected to the ducts using companion flanges and high temperature (1500F) gaskets or by a system specifically listed for such use, such as UL1978 or UL2221 listed duct systems.
2. Install the fan where there is room for service and removal.
3. Usually the duct to the fan is in a shaft and the shaft walls have a fire resistance rating. The space where the fan is located must have the same fire resistance rating as the shaft.
4. Flexible connectors are not allowed.
5. There must be a drain in the fan that is directed to a readily accessible and visible grease receptacle, ideally piped to the building grease trap.
6. The exhaust housing constructed of carbon steel not less than 1.52 mm (.060 in.), unless listed in accordance with the terms of the listing.
7. Inlet and outlet ducts will have access doors installed 3 feet from the fan for service and maintenance.
8. Minimum clearances are 18” inches to combustible, 3” inches to limited, 0” inches to non-combustibles.
9. All wiring and electrical equipment must comply with NFPA 70, National Electrical Code.

Up-Blast Curb Mount Utility Set Installation



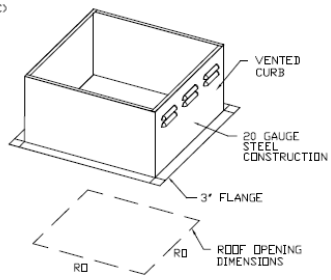
FEATURES:

- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL762
- HIGH HEAT OPERATION DIRECT DRIVE 300°F (149°C)
- HIGH HEAT OPERATION BELT DRIVE 500°F (260°C)
- HEAT SLINGER
- GREASE CLASSIFICATION TESTING
- TILT OUT WHEEL
- LOCKING PIN FOR POWER PACK
- MOTOR WEATHER COVER

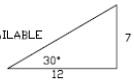
NORMAL TEMPERATURE TEST BELT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 500°F (260°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

NORMAL TEMPERATURE TEST DIRECT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

ABNORMAL FLARE-UP TEST BELT & DIRECT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

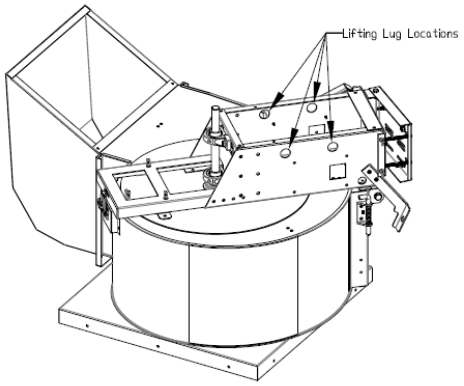


PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.

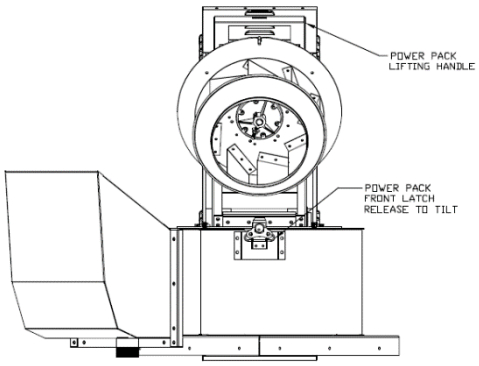


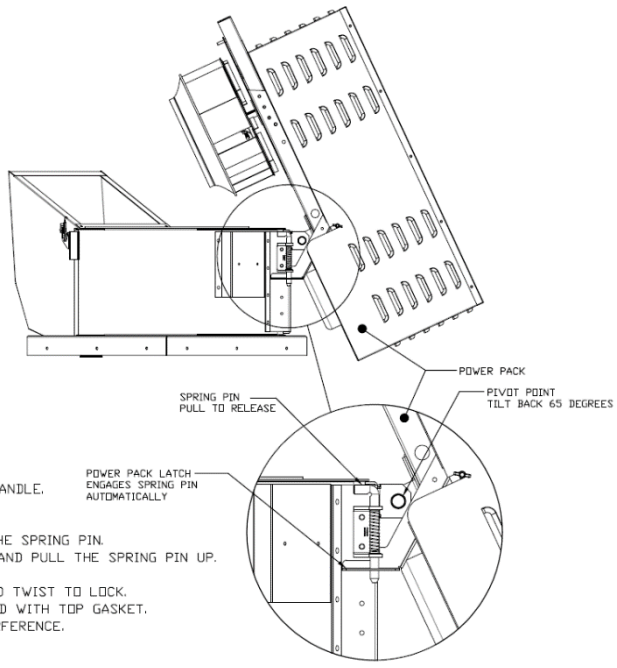
SPECIFY PITCH:
EXAMPLE: 7/12 PITCH = 30° SLOPE

OPTIONS:
GREASE BOX
PITCHED CURB
INSULATED CURB
RAIN CAP



Up-Blast Curb Mounted Utility Set Hinging Instructions



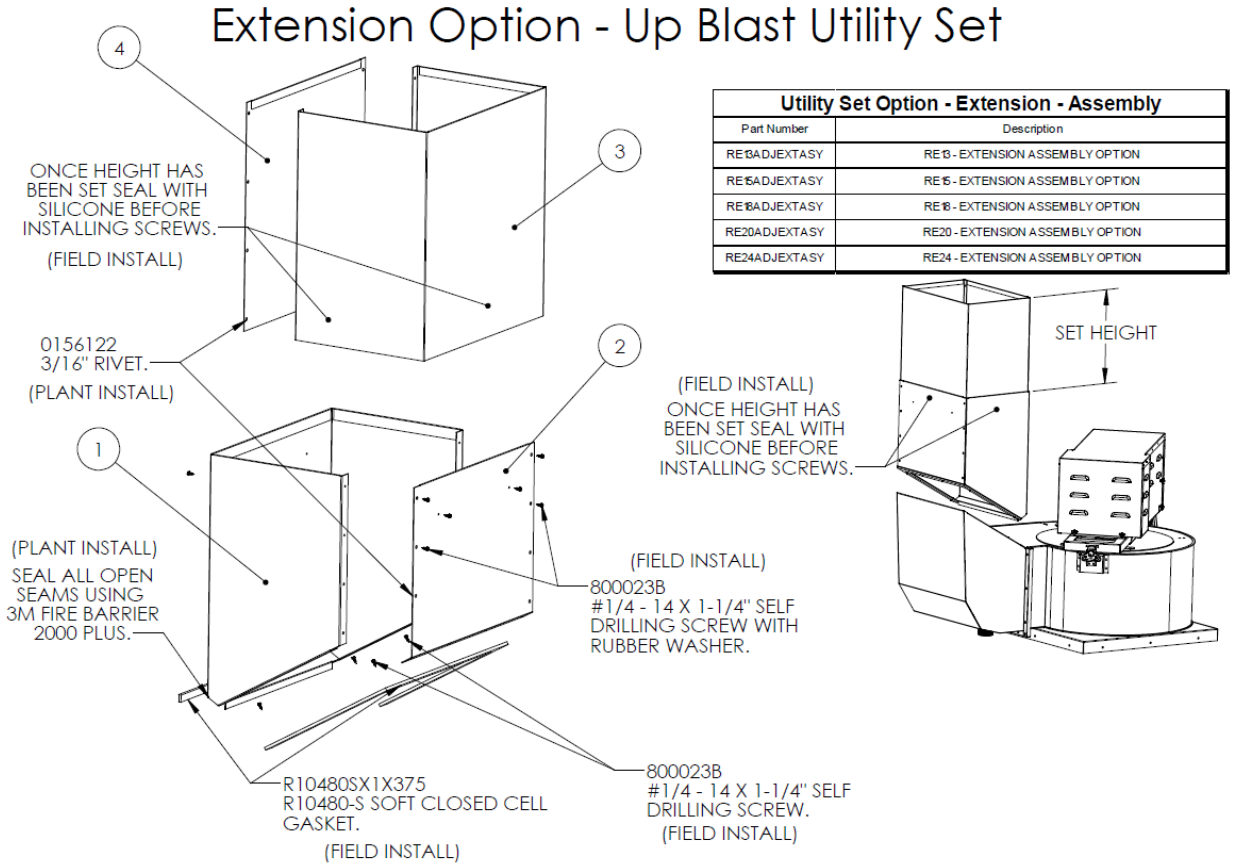


UTILITY SETS MAY NOT BE WALL MOUNTED

HINGING INSTRUCTIONS:

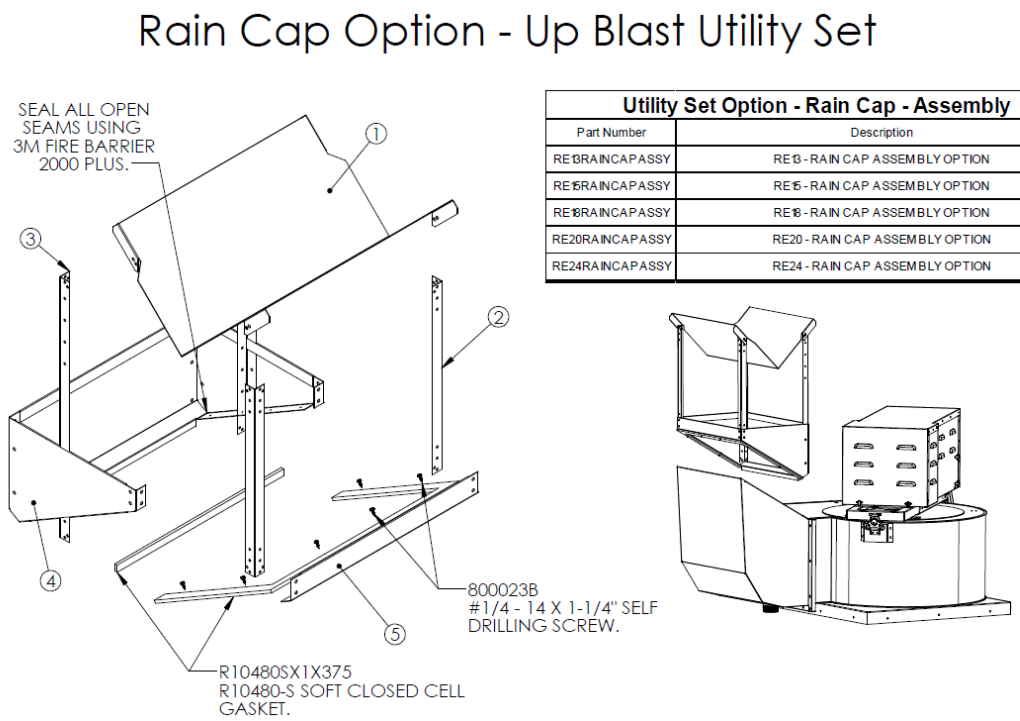
1 - TURN THE DISCONNECT TO THE OFF POSITION.
2 - TURN AND RELEASE THE LATCH FROM THE POWER PACK HANDLE.
3 - LIFT THE POWER PACK USING THE FRONT HANDLE.
4 - THE POWER PACK WILL TILT BACK 65 DEGREES.
5 - THE POWER PACK LATCH WILL AUTOMATICALLY ENGAGE THE SPRING PIN.
6 - TO CLOSE THE POWER PACK, HOLD THE LIFTING HANDLE AND PULL THE SPRING PIN UP.
7 - LOWER THE POWER PACK DOWN.
8 - ENGAGE THE FRONT LATCH INTO THE LIFTING HANDLE AND TWIST TO LOCK.
9 - INSPECT THE POWER PACK. TOP PLATE SHOULD BE SEALED WITH TOP GASKET.
10 - TURN THE WHEEL TO MAKE SURE THERE ISN'T ANY INTERFERENCE.

Up-Blast Curb Mounted Utility Set Discharge Extension Option



Utility Set Option - Extension - Assembly	
Part Number	Description
RE13ADJEXTASY	RE13 - EXTENSION ASSEMBLY OPTION
RE15ADJEXTASY	RE15 - EXTENSION ASSEMBLY OPTION
RE18ADJEXTASY	RE18 - EXTENSION ASSEMBLY OPTION
RE20ADJEXTASY	RE20 - EXTENSION ASSEMBLY OPTION
RE24ADJEXTASY	RE24 - EXTENSION ASSEMBLY OPTION

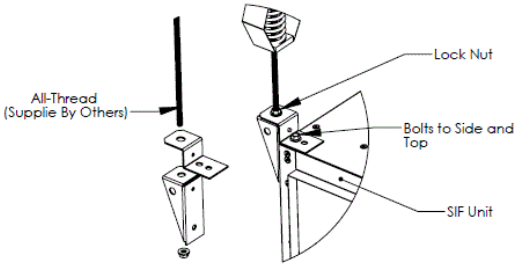
Up-Blast Curb Mounted Utility Set Rain Cap Option



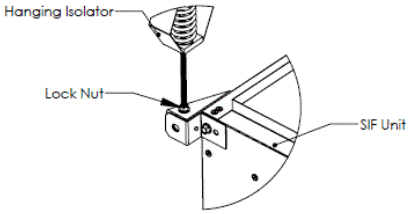
Utility Set Option - Rain Cap - Assembly	
Part Number	Description
RE13RAINCAPASSY	RE13 - RAIN CAP ASSEMBLY OPTION
RE15RAINCAPASSY	RE15 - RAIN CAP ASSEMBLY OPTION
RE18RAINCAPASSY	RE18 - RAIN CAP ASSEMBLY OPTION
RE20RAINCAPASSY	RE20 - RAIN CAP ASSEMBLY OPTION
RE24RAINCAPASSY	RE24 - RAIN CAP ASSEMBLY OPTION

Square Inline Mounting Bracket Detail

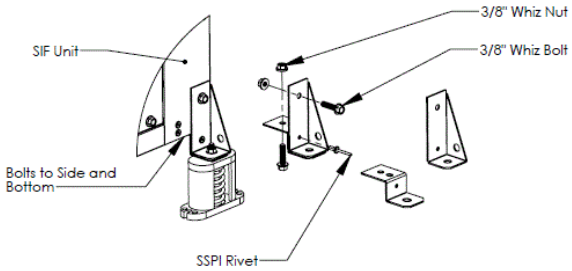
Horizontal Overhead Mount



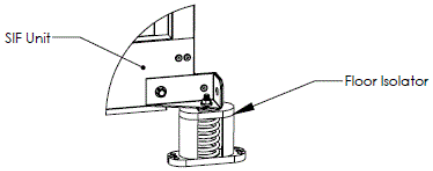
Vertical Overhead Mount



Horizontal Floor Mount

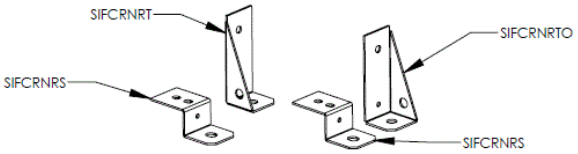


Vertical Floor Mount

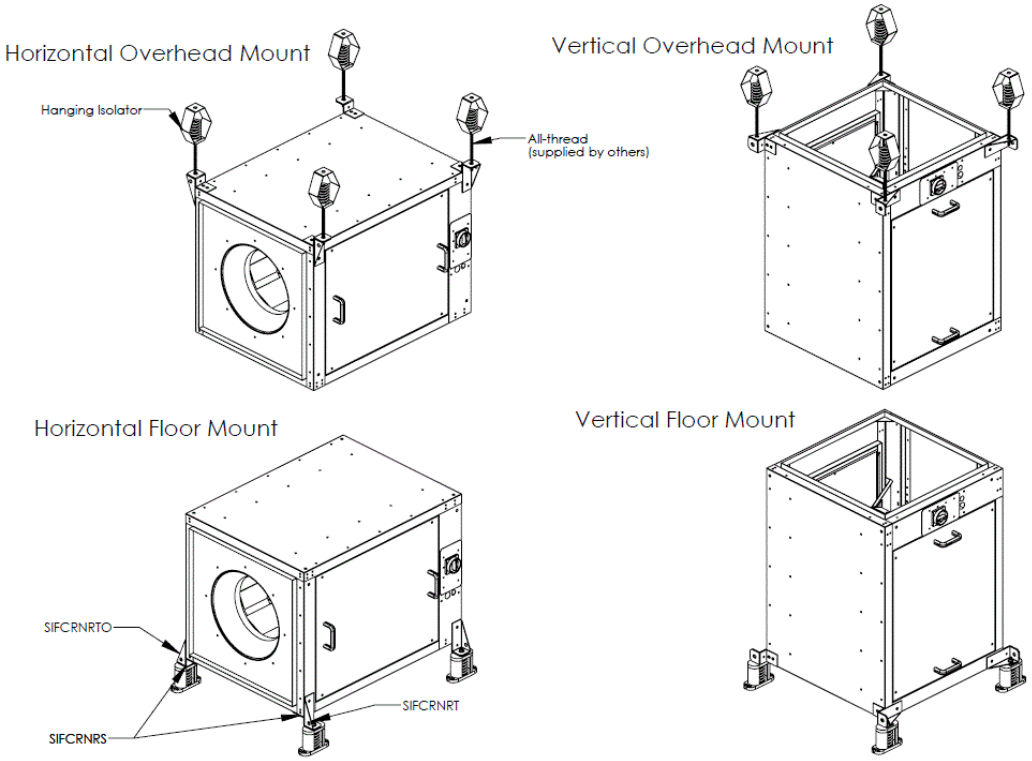


Each Mounting configuration requires:

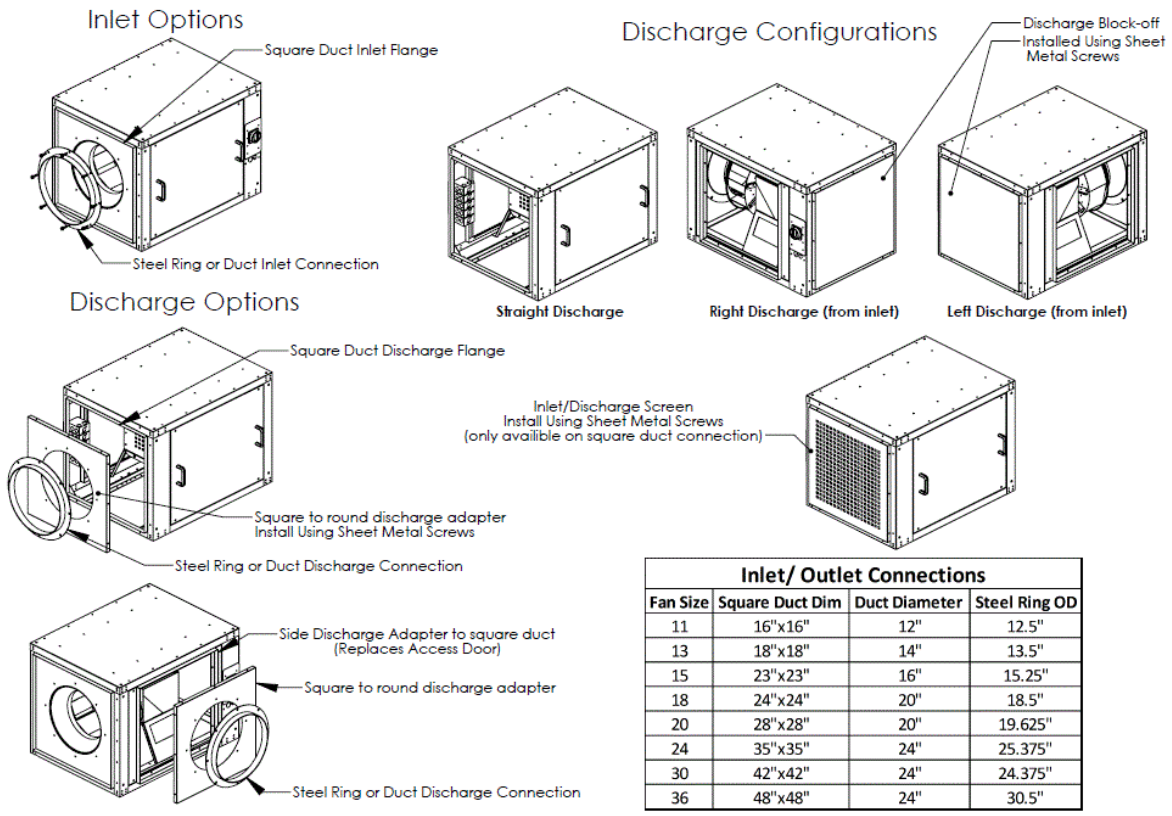
- (2) SIFCRNRT
- (2) SIFCRNRTO
- (4) SIFCRNRS



Square Inline Mounting Configurations

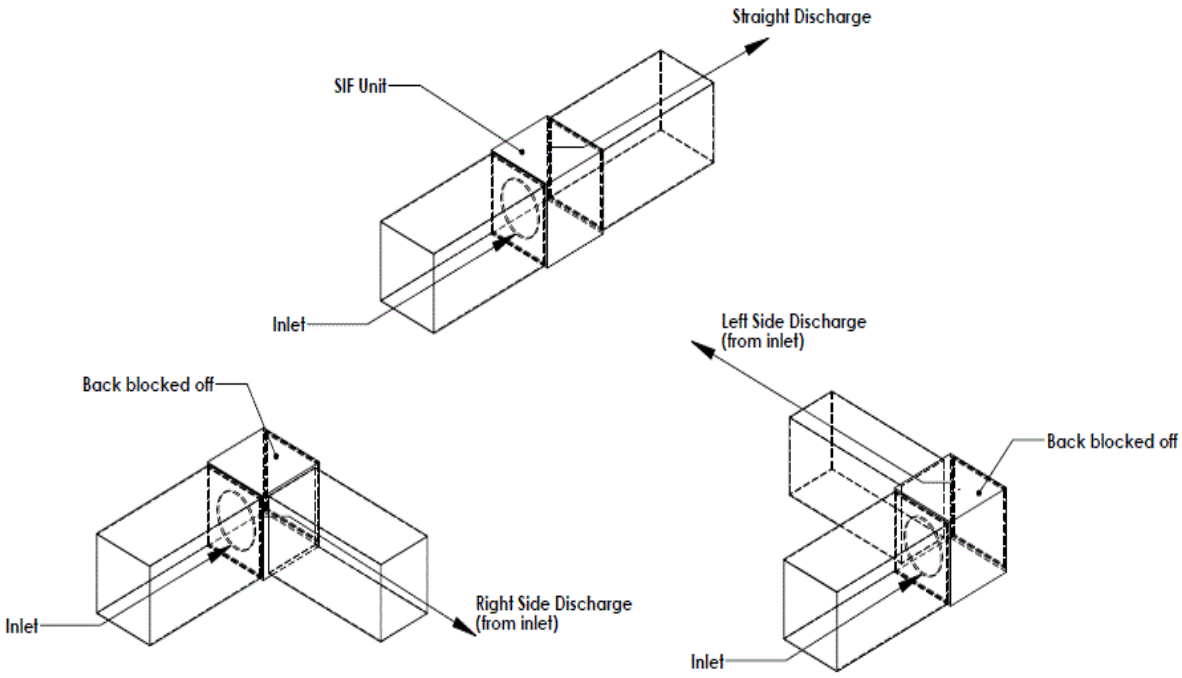


Square Inline Discharge Options



Inlet/ Outlet Connections			
Fan Size	Square Duct Dim	Duct Diameter	Steel Ring OD
11	16"x16"	12"	12.5"
13	18"x18"	14"	13.5"
15	23"x23"	16"	15.25"
18	24"x24"	20"	18.5"
20	28"x28"	20"	19.625"
24	35"x35"	24"	25.375"
30	42"x42"	24"	24.375"
36	48"x48"	24"	30.5"

Square Inline Discharge Configurations



Electrical

Before connecting power to the fan, read and understand this entire section of this document. As-built wiring diagrams are available with each fan by the factory.

Electrical wiring and connections should be done in accordance with local ordinances and the National Electric Code, ANSI/NFPA70. Be sure the voltage and phase of the power supply and the wire amperage capacity is in accordance with the motor nameplate. For additional safety information refer to AMCA publication 410-96, *Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans.*

WARNING!!

Disconnect power before installing or servicing fan. High voltage electrical input is needed for this equipment. This work should be performed by a qualified electrician.

Copper Wire Ampacity

Wire Size AWG	Maximum Amps
14	15
12	20
10	30
8	50
6	65
4	85

1. Always **disconnect power** before working on or near a fan. Lock and tag the disconnect switch or breaker to prevent accidental power up.
2. A disconnect switch is shipped with every fan. The switch is located on the exterior of up-blast fans and in the interior of down-blast fans. On down-blast direct drive fans, the disconnect function is built into the speed controller.
3. A dedicated branch circuit should supply the motor circuit with short circuit protection according to the National Electric Code. This dedicated branch should be run to the junction box mentioned above and connected as shown in a following illustration labeled “Fan to Building Wiring Connection”.
4. Make certain that the power source is compatible with the requirements of your equipment. The fan nameplate identifies the **proper phase and voltage** of the motor.
5. Before connecting fan to building power source, verify power line wiring is de-energized.
6. Secure the power cable to prevent contact with sharp objects.
7. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces or chemicals.
8. Before powering up fan check fan wheel for free rotation and make sure that the interior of the fan is free of loose debris or shipping materials.
9. If any of the original wire supplied with the fan must be replaced, it must be replaced with type TW wire or equivalent.

IMPORTANT: FANS WITH HINGE KITS REQUIRE ENOUGH SLACK IN THE WIRING TO THE FAN TO ALLOW FAN TO TILT BACK TO THE OPEN POSITION. ELECTRICIAN MUST CHECK THIS AND ACCOUNT FOR THE RANGE OF MOTION OF THE FAN.

Motorized Damper

On units shipped with the optional motorized damper, power must be supplied to the damper according to the damper nameplate. The damper motor is controlled external to the fan. E**xternal wiring to the damper motor is required**.

PSC (Permanent Split Capacitor) Motor Speed Control

Some single phase direct drive fans contain speed controls that regulate the amount of voltage going to the motor. Specific PSC motors must be used in conjunction with speed controls. The speed control has a knob with an off position, and high to low range. At high speed, the speed control allows all of the line voltage to pass right to the motor.

A minimum speed adjustment is provided to allow independent control of the minimum speed setting. Minimum speed adjustment ensures motor runs with sufficient torque to prevent stalling. To adjust this:

1) Motor must be in actual operating conditions to achieve proper speed adjustment. Motor will not slow down unless proper load is applied.
2) Turn main control knob to lowest speed position.
3) Locate and adjust minimum speed setting and adjust with small screw driver. This can be found under the speed control faceplate, (rotate clockwise to decrease minimum speed; counter-clockwise to increase minimum speed).
4) Motor will now operate from this preset minimum speed to full speed.

The lowest minimum voltage that may be applied to these motors is 65VAC. Running lower voltages to the motor can cause premature failure and overheating problems.

Electronically Commutated Motor (ECM) Speed Control

EC Motors and controls allow accurate manual adjustment of fan speed. The benefits of using an EC Motor are exceptional efficiency, performance, and motor life.

NOTE: To adjust the speed of 3 phase direct drive motors, a variable frequency drive is required.

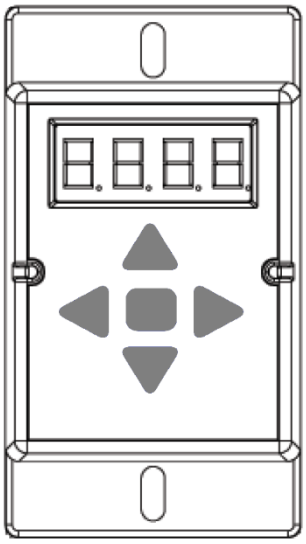
EVO EC Motor Control

The control unit features a 4 digit LED numerical display. The knob on the unit allows the user to set the flow index with a screwdriver. Twenty seconds later, the display shows the motor RPM. Then, the display periodically alternates between the flow index and motor RPM. The flow index has a range of 0 to 100% and is typically linear with motor RPM.

The EC Motor control requires a **24VAC** input and can locally turn the motor on and off. The motor can be adjusted between 300 RPM and maximum speed with this control.

RTC FSC-1 Motor Control

The control unit features a 4 digit LED display, with a five button interface. All parameters can be accessed through the user menu. The percent of run speed can be changed by using the Up, and Down buttons, followed by pressing Enter (middle button) to save changes. Every **ten seconds** the display will toggle between current percentage of run speed, and current RPMs. The flow index has a range of **0-100%** and is typically linear with motor RPM.

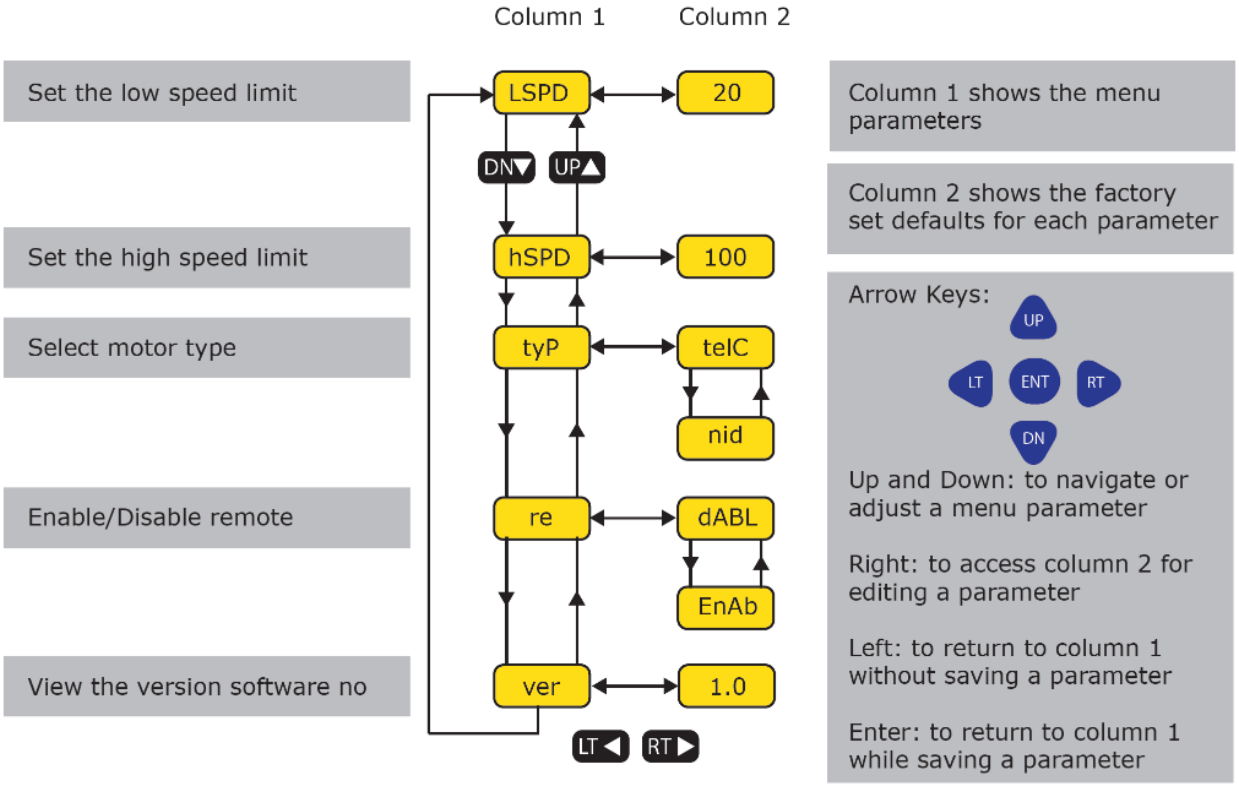


If the remote function (re) is enabled, the speed is controlled through a **0-10V** input. **0V = 0%** and **10V = 100%**, unless overridden by the low speed and high speed limits.

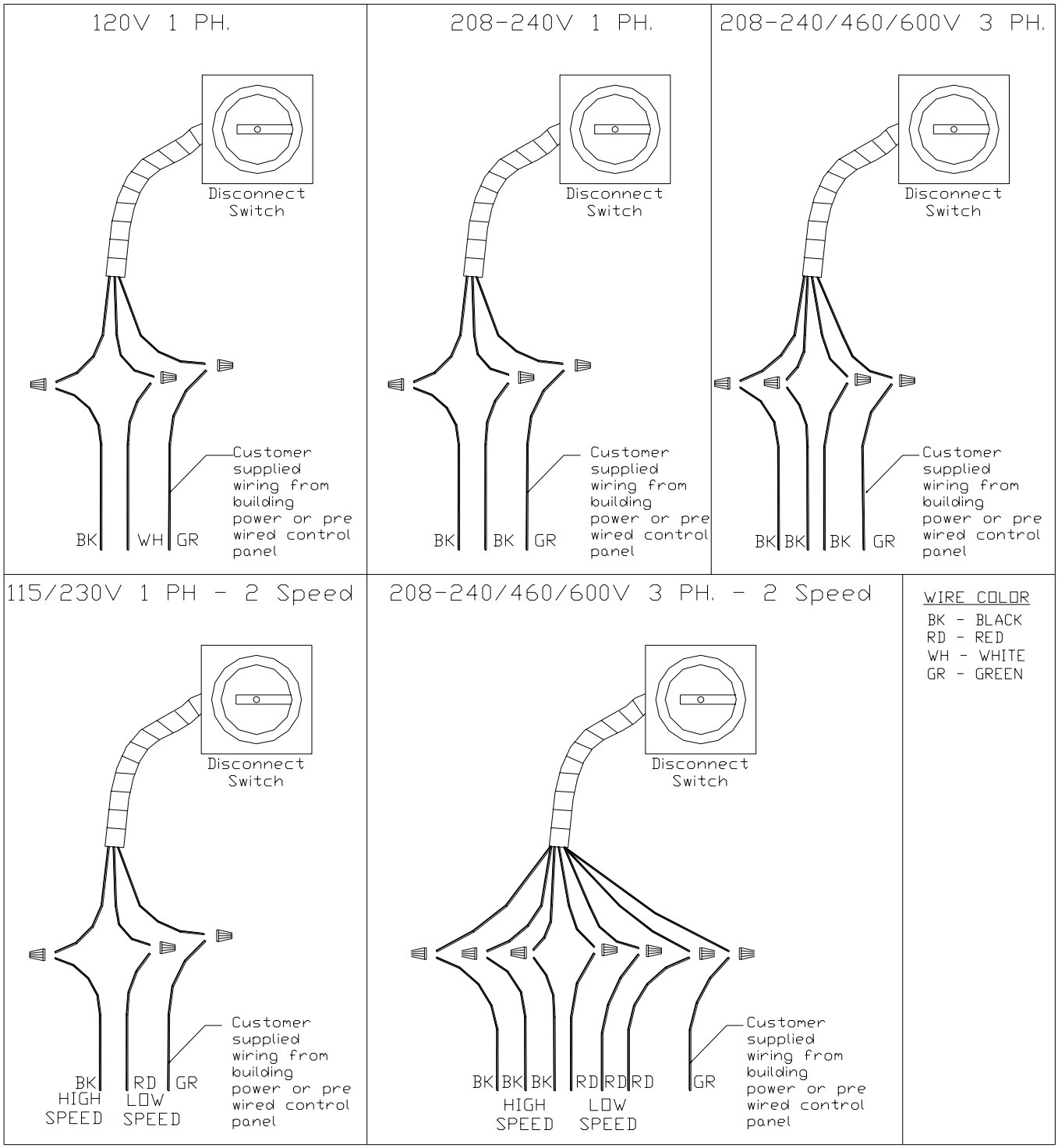
The EC Motor control requires a **24VAC** input and can locally turn the motor on and off. The motor RPM range is fully adjustable between the minimum and maximum set points, see LSPD and HSPD on the programming display. For more information see the control operating manual.

If “oFF” is being displayed, and the speed is set above 300 RPM, the ECM is not receiving RPM feedback. Check that the ECM is wired correctly. Check that the motor “tyP” in the settings matches the motor manufacturer.

Programming Map RTC FSC-1



Fan to Building Wiring Connection



Variable Frequency Drive (VFD) Installation Instructions

Input AC Power

1. Circuit breakers feeding the VFDs are recommended to be thermal-magnetic and fast acting. They should be sized based on the VFD amperage and according to the table below. Refer to the installation schematic for exact breaker sizing.
2. Each VFD should be fed by its own breaker. If multiple VFDs are to be combined on the same breaker, each drive should have its own protection measure (fuses or miniature circuit breaker) downstream from the breaker.
3. Input AC line wires should be run in conduit from the breaker panel to the drives. AC input power to multiple VFDs can be run in a single conduit if needed. **Do not combine input and output power cables in the same conduit.**
4. The VFD should be grounded on the terminal marked PE. A separate insulated ground wire must be provided to each VFD from the electrical panel. This will reduce the noise being radiated in other equipment.

ATTENTION!
DO NOT CONNECT INCOMING AC POWER TO OUTPUT TERMINALS U, V, W. SEVERE DAMAGE TO THE DRIVE WILL RESULT. INPUT POWER MUST ALWAYS BE WIRED TO THE INPUT L TERMINAL CONNECTIONS (L1, L2, L3)

VFD Output Power

1. Motor wires from each VFD to its respective motor MUST be run in a **separate steel** conduit away from control wiring and incoming AC power wiring to avoid noise and crosstalk between drives. An insulated ground must be run from each VFD to its respective motor. Do not run different fans output power cables in the same conduit.
2. Load reactors: If the distance between the VFD and the motor is great, a load reactor should be used between the VFD and the motor. The output reactor should be sized accordingly and installed within 10 feet of the output of the VFD. 208/230V – Load reactor should be used when distance exceeds 250 feet. 460/480V – Load reactor should be used when distance exceeds 50 feet. 575/600V– Load reactor should be used when distance exceeds 25 feet.
3. If the distance between the VFD and the motor is extremely long, up to 1000 FT, a dV/dT filter should be used and the VFD should be increased by 1 HP or to the next size VFD. The dV/dT filter should be sized accordingly and installed within 10 feet of the output of the VFD.
   208/230V – dV/dT filter should be used when distance exceeds 400 feet.
   460/480V – dV/dT filter should be used when distance exceeds 250 feet.
   575/600V – dV/dT filter should be used when distance exceeds 150 feet.
4. No contactor should be installed between the drive and the motor. Operating such a device while the drive is running can potentially cause damage to the power components of the drive.
5. When a disconnect switch is installed between the drive and motor, the disconnect should only be operated when the drive is in a STOP state.

VFD Programming

Programming

1. The Drive should be programmed for the proper motor voltage. P107 is set to 0 (Low) if motor voltage is 120 VAC, 208 VAC or 400 VAC. P107 is set to 1 (High) if motor voltage is 230 VAC,480 VAC or 575 VAC.
2. The Drive should be programmed for the proper motor overload value. P108 is calculated as Motor FLA x 100 / Drive Output Rating (available in table below).

To enter the PROGRAM mode to access the parameters:

1. Press the Mode (M) button. This will activate the password prompt (PASS).
2. Use the Up and Down buttons to scroll to the password value (the factory default password is “0225”) and press the Mode (M) button. Once the correct password is entered, the display will read “P100”, which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu.
3. Use the Up and Down buttons to scroll to the desired parameter number..
4. Once the desired parameter is found, press the Mode (M) button to display the present parameter setting. The parameter value will begin blinking, indicating that the present parameter setting is being displayed. The value of the parameter can be changed by using the Up and Down buttons.
5. Pressing the Mode (M) button will store the new setting and also exit the PROGRAM mode. To change another parameter, press the Mode (M) button again to re-enter the PROGRAM mode. If the Mode button is pressed within 1 minute of exiting the PROGRAM mode, the password is not required to access the parameters. After one minute, the password must be re-entered in order to access the parameters again.

P500 parameter provides a history of the last 8 faults on the drive. It can be accessed without getting into PROGRAM mode.

ACTECH SMV VFD CROSS-REFERENCE TABLE

Model Number	Volts	1Ø input	3Ø input	HP	Input Amps 1Ø 120VAC	Input Amps 1Ø 240VAC	Output Amps	Breaker 1Ø 120VAC	Breaker 1Ø 240VAC
ESV251N01SXB	120/240V	X		0.33	6.8	3.4	1.7	15	15
ESV371N01SXB	120/240V	X		0.5	9.2	4.6	2.4	15	15
ESV751N01SXB	120/240V	X		1	16.6	8.3	4.2	25	15
ESV112N01SXB	120/240V	X		1.5	20	10	6	30	20
					Input Amps 1Ø	input Amps 3Ø		Breaker 1Ø	Breaker 3Ø
ESV371N02YXB	240V	X	X	0.5	5.1	2.9	2.4	15	15
ESV751N02YXB	240V	X	X	1	8.8	5	4.2	15	15
ESV112N02YXB	240V	X	X	1.5	12	6.9	6	20	15
ESV152N02YXB	240V	X	X	2	13.3	8.1	7	25	15
ESV222N02YXB	240V	X	X	3	17.1	10.8	9.6	30	20
ESV402N02TXB	240V		X	5		18.6	16.5		30
ESV552N02TXB	240V		X	7.5		26	23		40
ESV752N02TXB	240V		X	10		33	29		50
ESV113N02TXB	240V		X	15		48	42		80
ESV153N02TXB	240V		X	20		59	54		90
ESV751N04TXB	480V		X	1		2.5	2.1		15
ESV112N04TXB	480V		X	1.5		3.6	3		15
ESV152N04TXB	480V		X	2		4.1	3.5		15
ESV222N04TXB	480V		X	3		5.4	4.8		15
ESV402N04TXB	480V		X	5		9.3	8.2		15
ESV552N04TXB	480V		X	7.5		12.4	11		20
ESV752N04TXB	480V		X	10		15.8	14		25
ESV113N04TXB	480V		X	15		24	21		40
ESV153N04TXB	480V		X	20		31	27		50
ESV183N04TXB	480V		X	25		38	34		70
ESV223N04TXB	480V		X	30		45	40		80
ESV303N04TXB	480V		X	40		59	52		100
ESV373N04TXB	480V		X	50		74	65		125
ESV453N04TXB	480V		X	60		87	77		150
ESV751N06TXB	600V		X	1		2	1.7		15
ESV152N06TXB	600V		X	2		3.2	2.7		15
ESV222N06TXB	600V		X	3		4.4	3.9		15
ESV402N06TXB	600V		X	5		6.8	6.1		15
ESV552N06TXB	600V		X	7.5		10.2	9		20
ESV752N06TXB	600V		X	10		12.4	11		20
ESV113N06TXB	600V		X	15		19.7	17		30
ESV153N06TXB	600V		X	20		25	22		40
ESV183N06TXB	600V		X	25		31	27		50
ESV223N06TXB	600V		X	30		36	32		60
ESV303N06TXB	600V		X	40		47	41		70
ESV373N06TXB	600V		X	50		59	52		90
ESV453N06TXB	600V		X	60		71	62		110

OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan **OFF** or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

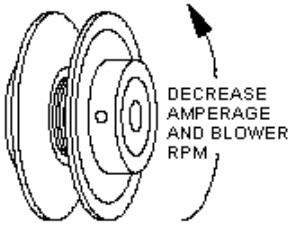
Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Check pulley alignment and belt tension as described below for belt drive fans.
3. Inspect the condition of the damper and damper linkage, if provided.
4. Inspect the air-stream for obstructions or debris in wheel.
5. Compare the supplied **voltage** with the fan's nameplate voltage. If this does not match, correct the problem.
6. Start the fan up, by turning the external disconnect to the **ON** position, and shut it **OFF** immediately to **check rotation of the wheel** with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
7. When the fan is started up, observe the operation and check for any unusual noises.
8. Switch the external disconnect back to the **ON** position and with the air system in full operation and all ducts attached, measure the system airflow. Motor sheave (pulley) is variable pitch, and allows for an increase or decrease of the fan RPM to adjust the airflow, as shown in the illustration below. For your convenience, a RPM chart is included in the following pages. If the fan is a direct drive version, it may have a speed control to adjust speed.
9. Once the proper airflow is achieved, measure and record the fan speed with a reliable tachometer. **Caution - Excessive speed will result in motor overloading or bearing failure. Do not set fan RPMs higher than specified in the maximum RPM chart.** See the troubleshooting guide for more information.
10. Measure and record the **voltage** and **amperage** to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.
11. Once the rpm of the ventilator has been properly set, disconnect power and recheck belt tension and pulley alignment as described below.

Pulley Setscrew Torque

Thread Size	Torque (IN/Lb)
No. 10 (bushing)	32
1/4" (bushing)	72
5/16"	130

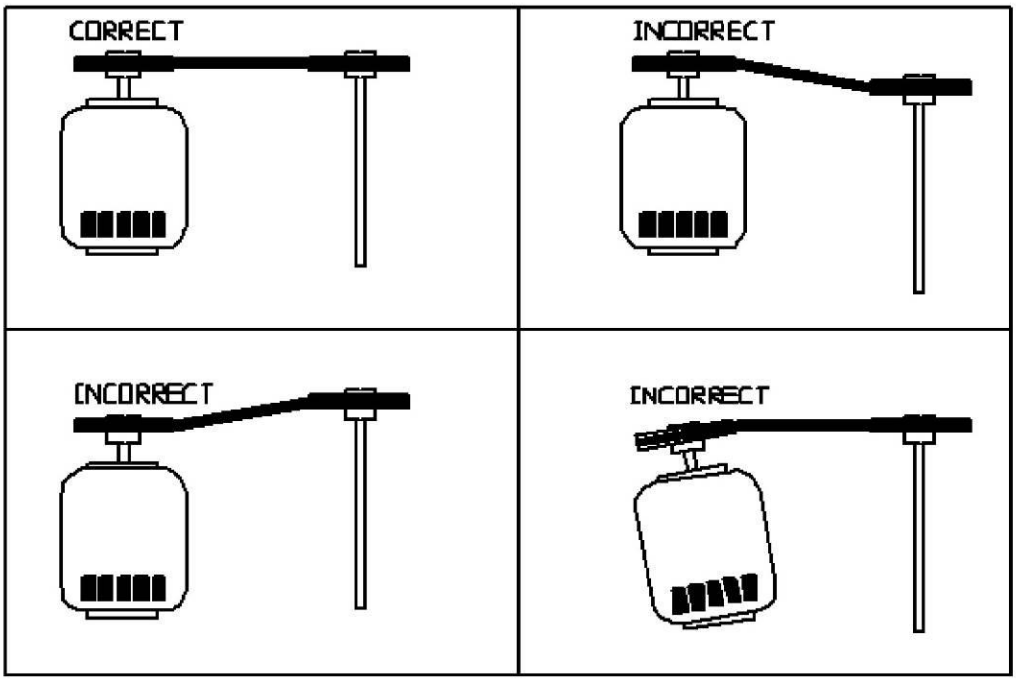
Pulley Adjustment Illustration



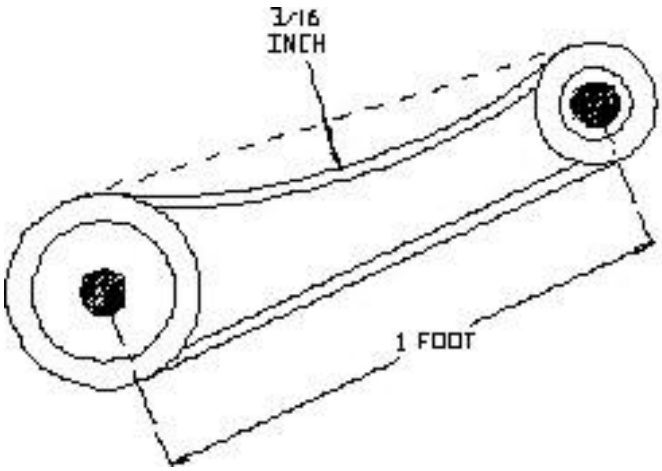
Pulley Adjustment (Belt Drive Fans)

The adjustable motor pulley is factory set for the RPM specified. Speed can be increased by closing or decreased by opening the adjustable motor sheave. Two groove variable pitch pulleys must be adjusted an equal number of turns open or closed. Any increase in speed represents a substantial increase in horsepower required by the unit. Motor amperage should always be checked to avoid serious damage to the motor when the speed is varied. Always torque setscrews according to the setscrew torque chart.

Pulley Alignment



Proper Belt Tension



Pulley Combination Chart

Motor RPM		1725													
1/3 to 1-1/2 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
AX BELTS		1VL34	1.9	2.9	2	3									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0		
AK114	11	11.2	308	323	339	354	370	385	400	416	431	447	462		

1/3 to 1-1/2 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
AX BELTS		1VL40	2.4	3.4	2.6	3.6									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0		
AK114	11	11.2	400	416	431	447	462	477	493	508	524	539	554		
AK94	9	9.2	488	506	525	544	563	581	600	619	638	656	675		
AK79	7.5	7.7	582	605	627	650	672	694	717	739	762	784	806		
AK66	6.2	6.4	701	728	755	782	809	836	863	889	916	943	970		
AK54	5	5.2	863	896	929	962	995	1028	1062	1095	1128	1161	1194		
AK46	4.2	4.4	1019	1059	1098	1137	1176	1215	1255	1294	1333	1372	1411		
AK39	3.5	3.7	1212	1259	1305	1352	1399	1445	1492	1539	1585	1632	1678		
AK32	3	3.2	1402	1455	1509	1563	1617	1671	1725	1779	1833	1887	1941		

2 to 5 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP42	2.9	3.9	3	4									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2BK160H	15.4	15.7	330	339	348	357	366	375	385	394	403	412	421	430	439
2BK140H	13.4	13.7	378	388	399	409	420	430	441	451	462	472	483	493	504
2BK120H	11.4	11.7	442	455	467	479	491	504	516	528	541	553	565	577	590
2BK110H	10.4	10.7	484	497	511	524	537	551	564	578	591	605	618	631	645
2BK100H	9.4	9.7	534	548	563	578	593	608	622	637	652	667	682	697	711
2BK90H	8.4	8.7	595	611	628	644	661	677	694	710	727	744	760	777	793
2BK80H	7.4	7.7	672	691	709	728	747	765	784	803	821	840	859	877	896
2BK70H	6.4	6.7	772	794	815	837	858	880	901	923	944	965	987	1008	1030
2BK60H	5.4	5.7	908	933	958	984	1009	1034	1059	1084	1110	1135	1160	1185	1211
2BK55H	4.9	5.2	995	1023	1050	1078	1106	1133	1161	1189	1216	1244	1272	1299	1327
2BK50H	4.4	4.7	1101	1132	1162	1193	1223	1254	1285	1315	1346	1376	1407	1438	1468

7-1/2 to 10 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP60	4.3	5.5	4.7	5.9									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2BK160H	15.4	15.7	516	527	538	549	560	571	582	593	604	615	626	637	648
2BK140H	13.4	13.7	592	604	617	630	642	655	667	680	693	705	718	730	743
2BK120H	11.4	11.7	693	708	722	737	752	767	781	796	811	826	840	855	870
2BK110H	10.4	10.7	758	774	790	806	822	838	854	871	887	903	919	935	951
2BK100H	9.4	9.7	836	854	871	889	907	925	943	960	978	996	1014	1031	1049
2BK90H	8.4	8.7	932	952	972	991	1011	1031	1051	1071	1091	1110	1130	1150	1170
2BK80H	7.4	7.7	1053	1075	1098	1120	1143	1165	1187	1210	1232	1255	1277	1299	1322

3 to 5 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP42	2.9	3.9	3	4									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2B5V278	27.8	28.1	184	189	194	200	205	210	215	220	225	230	235	240	246
2B5V250	25	25.3	205	210	216	222	227	233	239	244	250	256	261	267	273
2B5V234	23.4	23.7	218	224	230	237	243	249	255	261	267	273	279	285	291
2B5V200	20	20.3	255	262	269	276	283	290	297	304	312	319	326	333	340
2B5V184	18.4	18.7	277	284	292	300	307	315	323	331	338	346	354	361	369
2B5V160	16	16.3	317	326	335	344	353	362	370	379	388	397	406	414	423
2B5V154	15.4	15.7	330	339	348	357	366	375	385	394	403	412	421	430	439
2B5V136	12.6	12.9	401	412	423	435	446	457	468	479	490	501	513	524	535
2B5V124	12.4	12.7	407	419	430	441	453	464	475	487	498	509	521	532	543
2B5V110	11	11.3	458	471	483	496	509	522	534	547	560	572	585	598	611

7-1/2 to 10 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP60	4.3	5.5	4.7	5.9									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2B5V278	27.8	28.1	289	295	301	307	313	319	325	331	338	344	350	356	362
2B5V250	25	25.3	320	327	334	341	348	355	361	368	375	382	389	395	402
2B5V234	23.4	23.7	342	349	357	364	371	378	386	393	400	408	415	422	429
2B5V200	20	20.3	399	408	416	425	433	442	450	459	467	476	484	493	501
2B5V184	18.4	18.7	434	443	452	461	470	480	489	498	507	517	526	535	544
2B5V160	16	16.3	497	508	519	529	540	550	561	571	582	593	603	614	624
2B5V154	15.4	15.7	516	527	538	549	560	571	582	593	604	615	626	637	648
2B5V136	12.6	12.9	628	642	655	669	682	695	709	722	735	749	762	776	789
2B5V124	12.4	12.7	638	652	666	679	693	706	720	733	747	761	774	788	801
2B5V110	11	11.3	717	733	748	763	779	794	809	824	840	855	870	885	901

15 to 25 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP75	5.8	7	6.2	7.4									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2B5V278	27.8	28.1	381	387	393	399	405	411	417	424	430	436	442	448	454
2B5V250	25	25.3	423	430	436	443	450	457	464	470	477	484	491	498	505
2B5V234	23.4	23.7	451	459	466	473	480	488	495	502	509	517	524	531	539
2B5V200	20	20.3	527	535	544	552	561	569	578	586	595	603	612	620	629
2B5V184	18.4	18.7	572	581	590	600	609	618	627	636	646	655	664	673	683
2B5V160	16	16.3	656	667	677	688	698	709	720	730	741	751	762	773	783
2B5V154	15.4	15.7	681	692	703	714	725	736	747	758	769	780	791	802	813
2B5V136	12.6	12.9	829	842	856	869	883	896	909	923	936	949	963	976	990

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in “Off” position	Turn to “On” position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Broken fan belt	Replace belt
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Fan speed is too high	Reduce fan RPM
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
	Duct static pressure lower than design	Reduce fan RPM
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
	Duct static pressure higher than design	Improve ductwork to eliminate or reduce duct losses
	Blower speed too low	Increase fan RPM. Do not overload motor
	Belt slippage	Adjust belt tension
Excessive Airflow	Blower speed to high	Reduce fan RPM
	Duct static pressure lower than design	Reduce fan RPM
Excessive Vibration and Noise	Misaligned pulleys	Align pulleys
	Damaged or unbalanced wheel	Replace wheel
	Fan is operating in the unstable region of the fan curve	Refer to performance curve for fan
	Bearings need lubrication or replacement	Lubricate or replace
	Fan speed is too high	Reduce fan RPM
	Belts too loose, worn or oily	Inspect and replace if needed

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance.

Please record any maintenance or service performed on this fan in the documentation section located at the end of this manual.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. The type of grease and the amount of grease can is shown below. **Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.**
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.

Bearing Grease Charge

Ball Bearings	
Shaft Size (Inches)	**Grease Charge (Ounces)**
1/2 to 3/4	0.03
7/8 to 1 3/16	0.10
1 1/4 to 1 1/2	0.15
1 11/16 to 1 15/16	0.20
2 to 2 7/16	0.30
2 1/2 to 2 15/16	0.50
3 to 3 7/16	0.85
3 1/2 to 4	1.50

Bearing Grease Type

Thickener	Lithium Complex
Oil	Petroleum
Thickness	NLGI 2
Operating Temperature	-20 F to 200 F Intermittent to 250 F

2 weeks after startup

1. Belt tension should be checked after the first 2 weeks of fan operation on belt drive fans. Belts tend to stretch and settle into pulleys after an initial start-up sequence. **Do not tension belts by changing the setting of the motor pulley**, this will change the fan speed and may damage the motor. To re-tension belts, turn the power to the fan motor OFF. Loosen the fasteners that hold the motor to the fan. Move the motor to the left or right to adjust the belt tension. Belt tension should be adjusted to allow 1/64" of deflection per inch of belt span. Exercise extreme care when adjusting V-belts as not to misalign pulleys. Any misalignment will cause a sharp reduction in belt life and produce squeaky noises. Over-tightening will cause excessive belt and bearing wear as well as noise. Too little tension will cause slippage at startup and uneven wear. **Whenever belts are removed or installed, never force belts over pulleys without loosening motor first to relieve belt tension.** When replacing belts, use the same type as supplied by the manufacturer. On units shipped with double groove pulleys, matched belts should always be used.
2. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.

Every 3 months

1. Belt tension should be checked quarterly for belt drive fans. See instructions in the previous maintenance section. Over-tightening will cause excessive bearing wear and noise. Too little tension will cause slippage at startup and uneven wear.
2. Fans need to be cleaned quarterly, and more often in severe conditions.

Yearly

1. Inspect bearings for wear and deterioration. Replace/grease if necessary.
2. Inspect belt wear and replace torn or worn belts on belt drive fans.
3. Inspect bolts and set screws for tightness. Tighten as necessary.
4. Inspect motor for cleanliness. Clean exterior surfaces only. Remove dust and grease from the motor housing to ensure proper motor cooling. Remove dirt and grease from the wheel and housing to prevent imbalance and damage.

Start-Up and Maintenance Documentation

START-UP AND MEASUREMENTS SHOULD BE PERFORMED AFTER THE SYSTEM HAS BEEN AIR BALANCED (Warranty will be void without completion of this form)

Job Information

Job Name	
Address	
City	
State	
Zip	
Phone Number	
Fax Number	
Contact	
Purchase Date	

Service Company	
Address	
City	
State	
Zip	
Phone Number	
Fax Number	
Contact	
Start-Up Date	

Fan Unit Information

Refer to the start-up procedure in this manual to complete this section.

Name Plate and Unit Information	
Model Number	
Serial Number	
Volts	
Hertz	
Phase	
FLA	
HP	
Blower Pulley	
Motor Pulley	
Belt Number	

Field Measured Information	
Voltage	
Amperage**	
RPM	

Blower Rotation	Correct	
	Incorrect	

**If measured amps exceed the FLA rating on the nameplate, fan RPM must be reduced to decrease the measured amps below the nameplate FLA rating.

Maintenance Record

Date	Service Performed

Factory Service Department

Phone: 1-866-784-6900
Fax: 1-919-554-9374

Sound Enclosure Installation Manual

REV 102017

Safety Disclaimer

- Always work safely when installing metal products and use extreme caution on the roof at all times.
- Wear gloves and safety glasses to reduce the risk of injury, and use hearing protection when operating power tools.
- Many of the panels are extremely heavy and awkward. Adhere to safe lifting procedures to avoid physical injury.
- Always be sure that ladders are safely positioned and properly secured.
- Safety harnesses or other special equipment may be required; be sure to consult OSHA guidelines for compliance with all safety requirements.
- Do NOT walk on panels until all the fasteners are installed. Metal roofing panels are slippery when wet, dusty, frosty, or oily -- Do NOT attempt to walk on a metal roof under these conditions.
- Wear soft-soled shoes to improve traction and to minimize damage to the paint finish (if applicable).

Pre-Installation

Thank you for purchasing a sound enclosure. This manual provides general assembly or disassembly instructions. It is not specific to your unit and should be used as a guideline only.

The labels are removable and may be removed after installation is complete.

Tools Required

You will need at least 1-2 people for installation and the following tools:

- Forklift and chains
- Ladder or Similar
- Pneumatic Air Driver
- 9/16 Socket Driver
- 5/16 Socket Driver
- (4) Clamps or similar

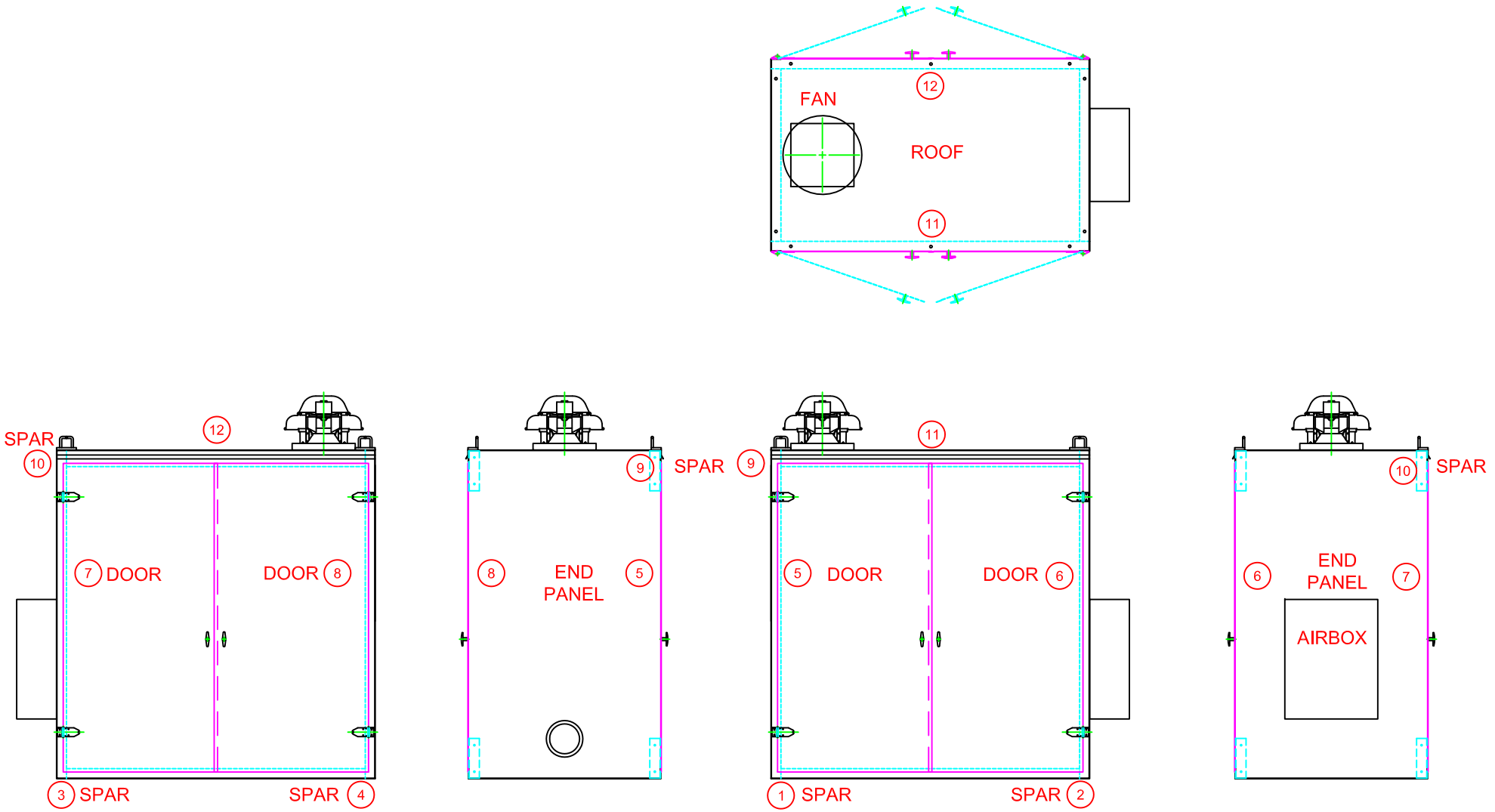
Parts List

A typical sound enclosure has the following parts:

- 3/8 x 1-1/4 Bolts and washers
- Self Tapping Screws for Fan installation
- (4) Door Panels #5/#6
- (8) Door Hinge Washers
- (1) Roof Panel #11/#12
- (1) Flat End Panel #5/#8
- (1) Air Box End Panel #6/#7
- (2) Top Spars #9/#10
- (2) Bottom Spars #1/#2 and #3/#4

If your unit shipped unassembled each panel will be numbered. Where it meets another panel it is labeled with the same number so you would match 1 to 1, 2 to 2, etc. The white PVC sheeting is to protect the unit during shipment and may be removed.

Use the following drawing of the assembled enclosure to familiarize yourself with the different panels and how they fit together.



APPROVAL REQUIRED

THIS JOB IS ON HOLD UNTIL PATHFINDER SYSTEMS RECEIVES WRITTEN APPROVAL

DATE: SIGNATURE:

REV 4	DATE:	BY:	CHK'D:	REMARKS:
REV 3	DATE:	BY:	CHK'D:	REMARKS:
REV 2	DATE:	BY:	CHK'D:	REMARKS:
REV 1	DATE:	BY:	CHK'D:	REMARKS:
REV 0 ORIGINAL RELEASE	DRAWN BY: JASON	DATE: 11/8/12	SCALE: 3/8" - 1"	

PATHFINDER SYSTEMS INC.
6301 Deramus Avenue
Kansas City, MO 64120
816-741-0282
816-587-0282 FAX
mail@pathfindersystems.net
www.pathfindersystems.net

CUSTOMER:
CUSTOMER PO#:
PROJECT:
DESCRIPTION: SOUND ENCLOSURE

PATHFINDER JOB#:

REV 00

Installation

You will need 2 people for the next steps.
The following pictures are not specific to your unit and should be used as a guideline to assemble the panels.

1. Position an End Panel to meet the Bottom Spars #1 and #3.

2. Use (2) 3/8 bolts and washers on each side to fasten the Spars to the End Panel.

3. Position the Airbox End Panel to meet the Bottom Spars #2 and #4.

4. Use (2) 3/8 bolts and washers on each side to fasten the Spars to the End Panel.
5. Locate the Top Spars #9 and #10.
6. Install the spars as show below. You will not bolt anything at this time. The braces should fit snug.

7. Use (4) clamps to temporarily secure the Top Spars to the End Panels. See below.

8. Use a forklift and secure chains to the lifting lugs on the Roof Panel #11/#12 as shown below.

9. Lift the roof panel and install into place. Make sure you match the label #11 as the panel will only fit one way.

10. Use 3/8 Bolts to fasten the Roof Panel to the Top Spars.

11. Use 3/8 Bolts to fasten the Roof Panel to the End Panels.

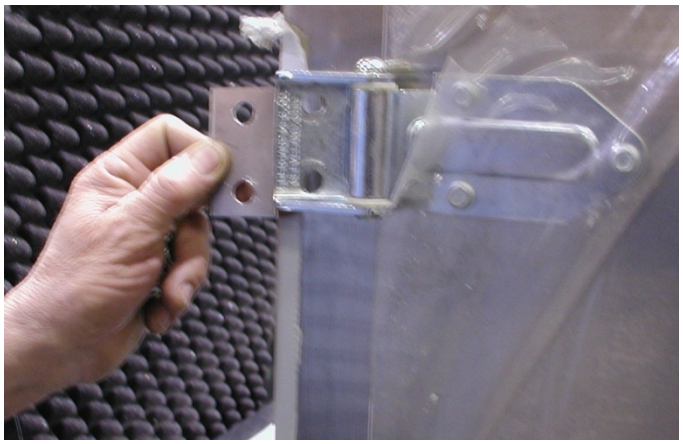
12. Remove all (4) temporary clamps.

13. If necessary, install the doors. Depending on what type of hinge you have, you may have to fasten the bolts. Welded hinges allow for the door to lift off and on.

    Do not lose the washers that come with the hinges or your doors will not work properly.

Bolt Hinges

Weld Hinges



14. Use a forklift to lift the fan on to the roof.
15. Use 1/8” self-tapping screws to secure the fan to the bracket on the Roof.
16. Have a certified electrician wire the fan and your sound enclosure is complete!

Knock Down Instructions

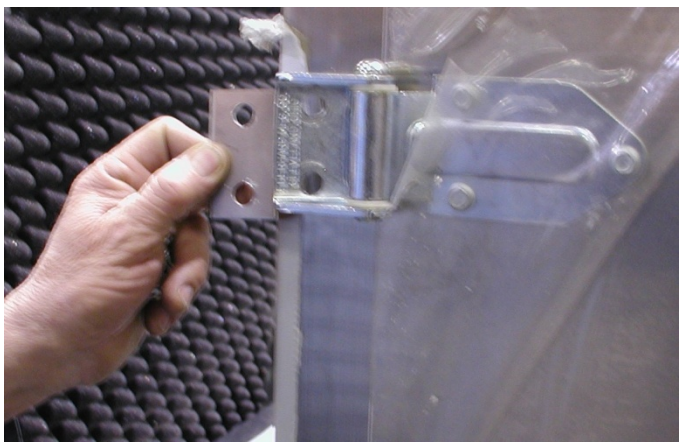
You will need at least 1-2 people for the next steps.
The following is a guideline you can use to safely take apart the sound enclosure.

1. Have a certified electrician remove power from the fan/unit.
2. Remove 1/8” self-tapping screws that secure the fan to the bracket on the Roof. If necessary, use a forklift to remove the fan.
3. Position one person inside and one outside. Remove 1/2-13 x 7" bolts, nuts and washers from the Roof. The nuts can be accessed from inside the unit.

4. Use a forklift and chains to remove the Roof Panel. It only fits one way so you might want to note how it is installed. There may be silicone caulk between the roof and top of the panels.

5. Remove the doors. Depending on what type of hinge you have, you may have to remove some bolts. Welded hinges lift off.

Do not lose the washers that come with the hinges or your doors will not work properly.

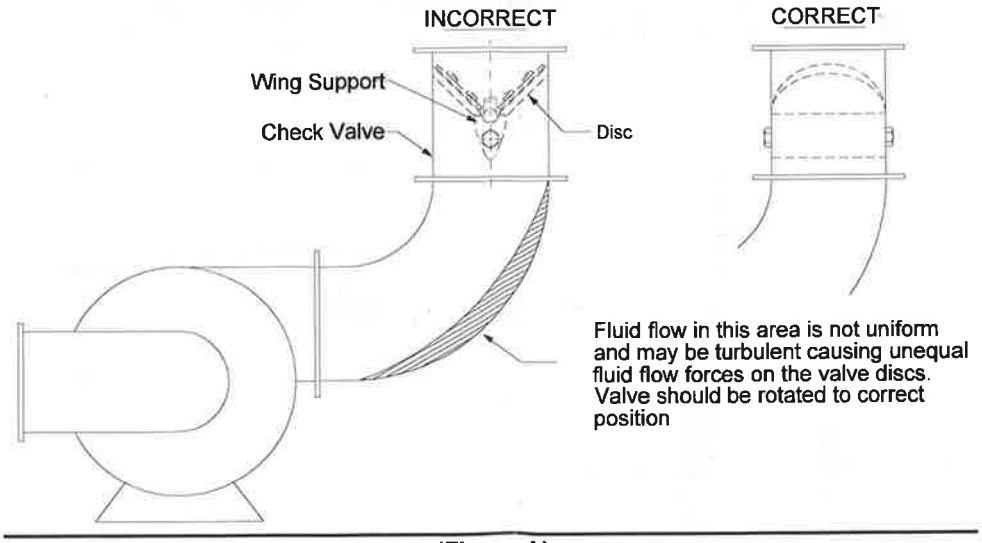


U.S. VALVE
812-E Oregon Avenue
Linthicum, Maryland 21090
tel (410) 789 0999
fax (410) 789 1009

INSTALLATION INSTRUCTIONS

VALVE INSTALLATION:

1. Remove check valve from packaging and inspect for any shipping damage or loose fasteners. All fasteners have been set with Loctite®. If damaged in shipping, save original box and box contents.
2. If check valve is to be painted or insulated, record the US Valve data on the valve identification tag.
3. If valves are being stored, they should be in a weather-protected area, preferably indoors.
4. Open and close the discs of your valve a few times by hand to assure freedom of movement.
5. **The flow arrow** on your valve indicates the direction of flow upon installation.
6. Use only a **strap type wrench** for installation to prevent distortion of the valve body.
7. The check valve is **not suitable for use on a discharge** of reciprocating compressors. Pulsating and cyclic flow will damage the valve.
8. **If this valve is installed in a horizontal line,** make sure the screws protruding through the top and bottom of the valve body are in the vertical position. Maintain at least 6 pipe diameters of straight length of piping between the check valve and any other line restriction, i.e. elbows, tees, valves, etc.
9. **If the valve installation is in a vertical line with upward flow,** the position of the wing support is not important. There should be at least 6 pipe diameters of straight unrestricted piping upstream and downstream of the check valve. If space conditions do not allow for this, the valve must be installed so that the flow is equally distributed across the two valve discs *(see figure A below).*



(Figure A)

FOR REPLACEMENT OF INTERNALS, SEE REVERSE SIDE →

PARTS REPLACEMENT INSTRUCTIONS

COMPLETE REPLACEMENT OF VALVE INTERNALS:

1. Carefully remove valve from pipeline. **USE ONLY A STRAP TYPE WRENCH.**
2. Hold the valve body in your hand or in a suitable vise to prevent distortion of the valve body. **NOTE: DO NOT EXERT UNDO FORCE ON THE VALVE BODY.** This may permanently effect the valve operation.
3. Remove all valve internals by unscrewing the Wing Support screws *(see Figure 1 below)* and any other body support rods such as travel stop rods (only on large size valves).

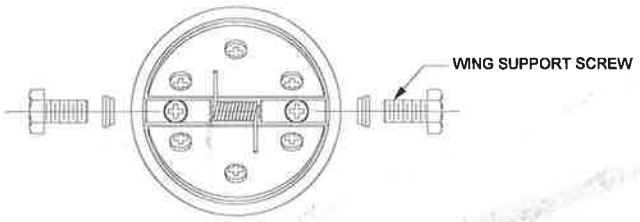
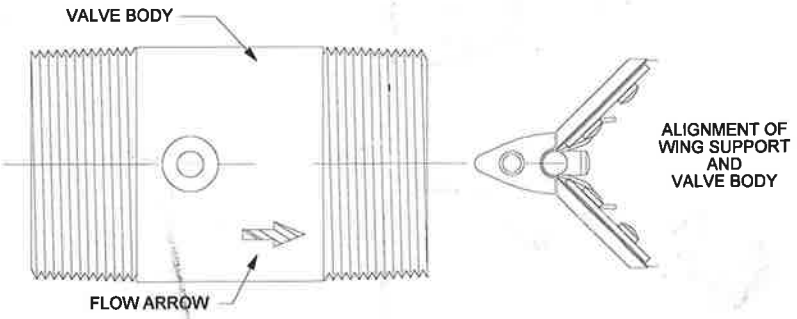


FIGURE 1

4. Inspect the body inside diameter to determine if the body is suitable and retains its original integrity i.e. surface finish is good and roundness apparent.
5. If valve body appears satisfactory and needs only minor cleanup, the valve is then suitable to replace the internals. **DO NOT SANDBLAST OR OTHERWISE DAMAGE THE VALVE BODY'S INNER SURFACE.**
6. Make sure when you order complete internal replacement assemblies that the new assemblies are identical to the original internals. Always reference your check valve's unique serial number when ordering replacements.
7. **Install the new assembly:**
   (a) Put some water on the elastomer seal to act as a lubricant when installing the new wing support assembly into the valve body.
   (b) Make sure you assemble the wing assembly correctly with the direction of flow.
   (c) Align the wing support mounting screw holes and the valve body screw holes properly. *(See Figure 2).*



(Figure 2)

   (d) Push wing support assembly into the valve body until the holes line up properly. If you overshoot the hole alignment by half the screw hole diameter, just push the wing support assembly completely through the valve body and repeat the procedure.
   (e) When installing the wing support mounting screws, make sure you install a new Nylite® pressure seal and apply a sufficient amount of Loctite® #272 to the screw threads. The wing support screws should be torqued to 8-ft-lbs for ¼-20 screws and 48 in-lbs for 10-32 screws. Never over tighten screws.
   (f) Allow Loctite® to dry 20 minutes, full cure in 24 hours.

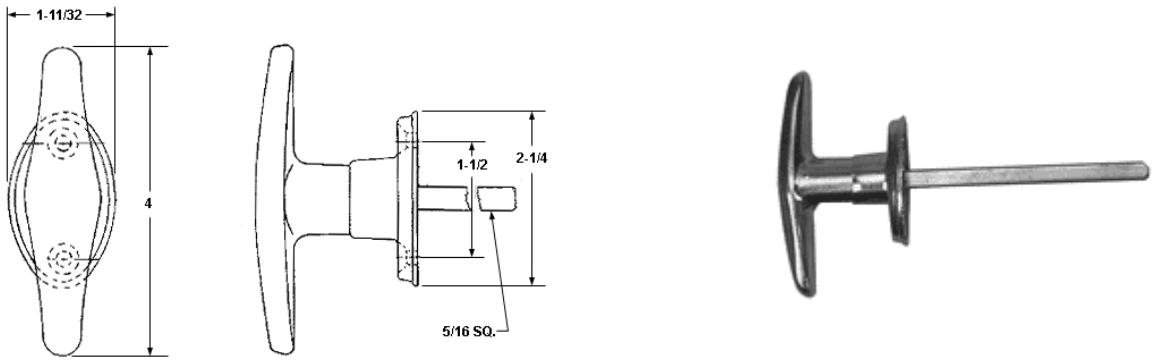
Sound Enclosure Hardware

Bill of Materials

Description	Part Number	Typical Qty
Handle	GD206	4
Rod	5611-5-48	8
Center for Rod	5611	4
Lifting Lugs	710-GZ	4
Bolt-On Hinge	5867	8
Convoluted Foam	PSI #618	N/A
Fan (Custom Sized)	Consult your quote	1
Grab Handle (Optional)	TH555	4
Weld Hinge, Lift Off Doors (Optional)	R194-0135AL	8

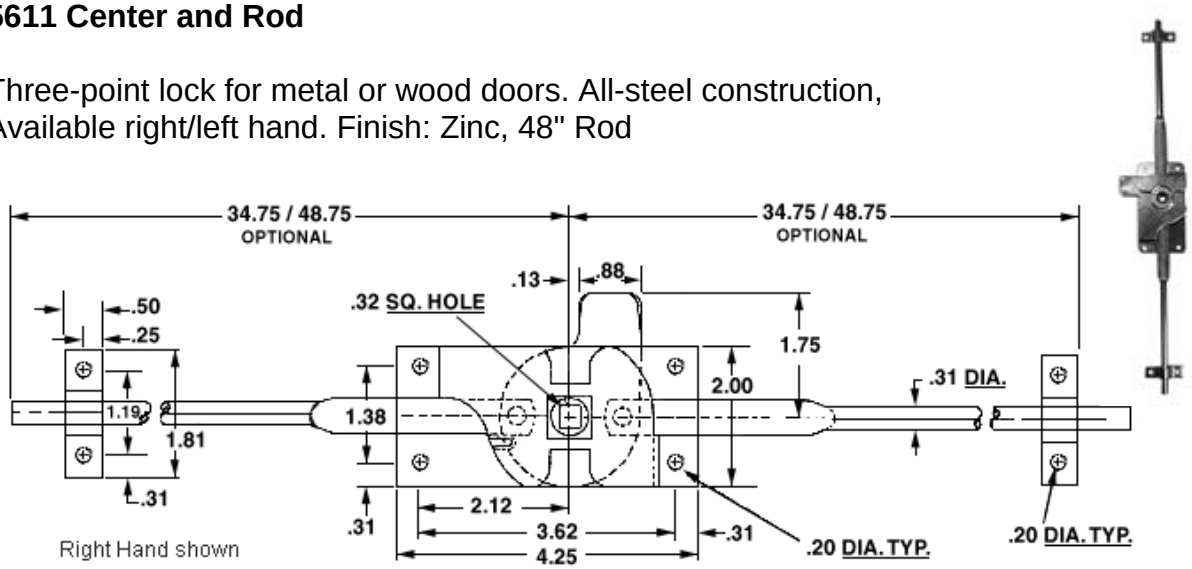
GD206 Handle

Plain 'T' Handle, with 4" shaft, 5/16 in. sq. 1-1/2"
center to center mounting plate. Finish: bright chrome.



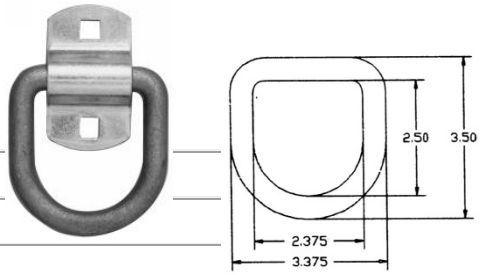
5611 Center and Rod

Three-point lock for metal or wood doors. All-steel construction,
Available right/left hand. Finish: Zinc, 48" Rod



710-GZ Lifting Lug

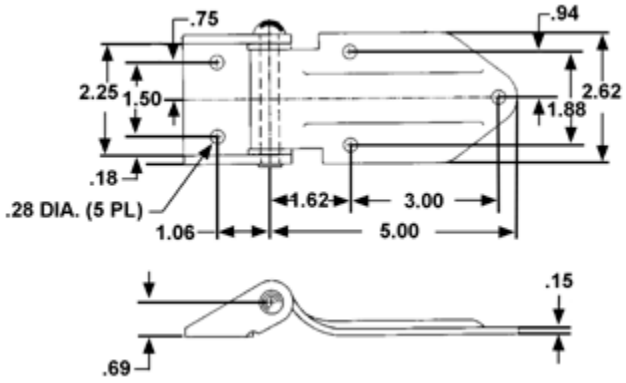
Tie down ring with bolt-on clip, gold zinc finish

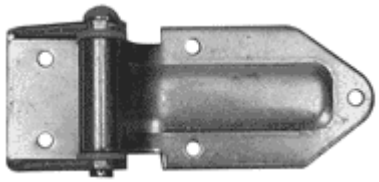


Finish	Gold Zinc
Length	3-1/2"
Width	3-1/4"
Material	Steel
Diameter	1/2"
Breaking Strength	12,000 lbs.

5867 Bolt-On Hinge

5" Stamped Steel Hinge for flush mounting, Five mounting holes, 9/32" dia. Has nylon sleeve bearings for easier operation. Door movement 180 degrees.
7 gauge steel butt. 9 gauge steel strap.





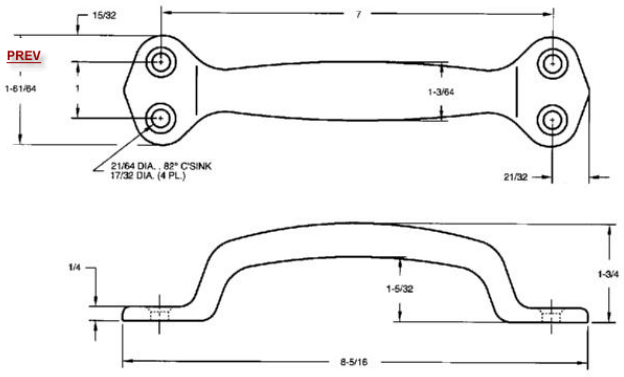
R194-0135 Weld-On Hinge (Optional)

Weld-On Hinge, Lift off type, Aluminum, with a Stainless Steel Pin and Bearing Washer.

Length	5-1/4"
Material Thickness	13/16"
Pin Diameter	15/32"

TH555 Grab Handle (Optional)

Chrome plated, Solid die-cast, 8-15/16" overall length, 125/32" overall height, (4) #14 mtg. holes for oval head screws on 7" x 1" centers, 15/32" inside grab handle height



Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

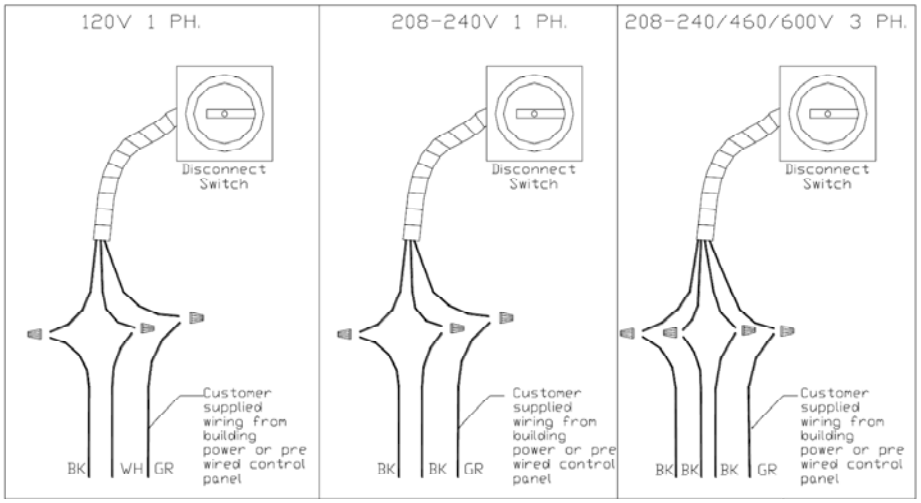
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.

6. Position one person inside and one outside. Remove 1/2-13 x 7" bolts, nuts and washers that fasten the panels together. There may be silicone caulk between the roof and top of the panels.

7. Continue until you have taken apart all panels.
8. Reverse this procedure to assemble the enclosure. Remember to use silicone caulk between the panels for outdoor applications.

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WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at **1-866-784-6900** for warranty and technical support issues.

Mechanical

WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.
5. Inline fans can be interior mounted, motors shall be located outside of the exhaust airstream.
6. Interior mounted fans must have a grease drain that is piped to an approved grease reservoir.
7. Interior mounted fans are considered part of the duct system. Clearance to combustibles must be maintained are all time. If needed the fan may be wrapped to maintain the duct system fire rating.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. If a backdraft damper is required, it should be secured within the curb using sheet metal screws, to the bottom of a damper box or damper support flanges located below the roof deck. **CAUTION: NFPA-96 RECOMMENDS THAT DAMPERS SHOULD NOT BE INSTALLED WHEN EXHAUSTER IS USED FOR REMOVAL OF SMOKE AND GREASE LADEN VAPORS FROM COMMERCIAL KITCHEN EQUIPMENT. CONSULT STATE AND LOCAL CODES FOR DETAILED REQUIREMENTS.**
3. If an up-blast fan is used for kitchen hood exhaust, ensure discharge is at least 40 inches above the roof surface in accordance with NFPA96.
4. On an up-blast fan, normally the power cord is brought through the conduit tube located on the top skirt on the outside of the unit.
5. Secure ventilator curb through vertical portion of the ventilator base assembly flange using a minimum of eight (8) lug screws, anchor bolts, or other suitable fasteners (not furnished).
6. Before connecting fan motor to power source verify power line wiring is de-energized.
7. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
8. Before powering up fan check ventilator wheel for free rotation.
9. Check all fasteners for tightness.
10. Re-install motor dome.
11. A drain pipe is provided for single-point drainage of water and residue on up-blast fans. The drain pipe should be positioned towards the roof slope. Some means for collection of this residue must be provided, either a container directly under the trough or use of an adapter and pipe to carry the residue to a remote collection point. An optional down spout and grease collection box is available as an accessory item for up-blast fans.

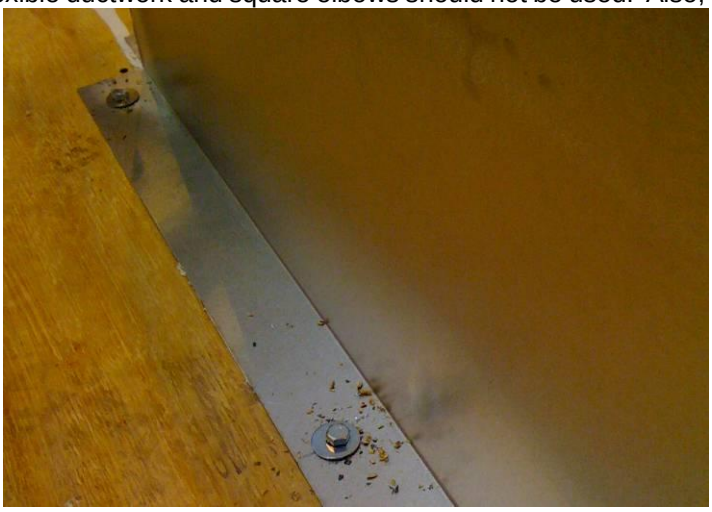
Wall Mounting

1. The same instructions, warnings and notes found under Roof Mounting section will apply. Refer to steps 2 and 3, and steps 5 through 8.
2. **Masonry Wall:** Around the wall opening install an angle iron frame at least 2" x2" x ¼". Frame should be approximately 1/2" smaller than the inside base dimension of the ventilator. Secure the lead cinch type anchors with non-ferrous bolts (3 per side). The ventilator should be mounted to the mounting angle with self-taping sheet metal screws (3 per side).
3. **Wood Sidings:** Around the wall opening install a wooden frame 2" high x 2" wide. Frame should be approximately 1/2" smaller than the inside base dimension of the ventilator. Secure with counter-sunk expansion type lag bolts (3 per side). The ventilator should then be mounted to the mounting frame with the square head wood screws (3 per side) 3/8" minimum.
4. Steel wall mount brackets are also available as a factory option for the fan.
5. The mounting flange connections should be coated with a suitable caulking compound or an approved waterproof mastic sealer.
6. Wall mount application is not recommended from fans with wheels 30" or larger.

IMPORTANT: OSHA REGULATIONS REQUIRE THE VENTILATOR TO BE MOUNTED AT LEAST EIGHT (8) FEET ABOVE GROUND OR FLOOR LEVEL.

Curb and Ductwork

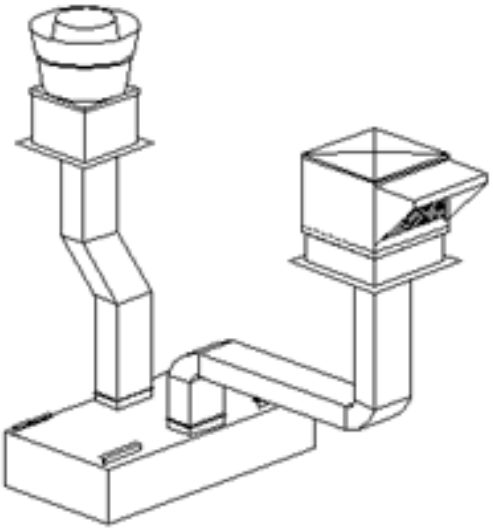
This fan was specified for a specific CFM and static pressure. The ductwork attached to this unit will significantly affect the airflow performance. Flexible ductwork and square elbows should not be used. Also, transitions and turns in ductwork near the fan inlet will cause system effect and will drastically increase the static pressure and reduce airflow. **Follow SMACNA guides and recommendations for the remaining duct run.** Fans designed for rooftop installation should be installed on a prefabricated or factory built roof curb. Follow curb manufacturer's instructions for proper curb installation. Curbs should be connected to structural roof members with at least four (3) lug screws, anchor bolts, or other suitable fasteners (not furnished) per curb flange. Curb flanges should be caulked to roof.



The fan should be installed on a curb and/or rail elevated not less than 14" above any surface. Be sure duct connection and fan outlet are properly aligned and sealed. Secure fan to curb through vertical portion of the ventilator base assembly flange using a minimum of eight (8) lug screws, anchor bolts, or other suitable fasteners (not furnished). Shims may be required depending upon curb installation and roofing material. Check all fasteners for tightness. The diagrams below show different mechanical installation configurations.

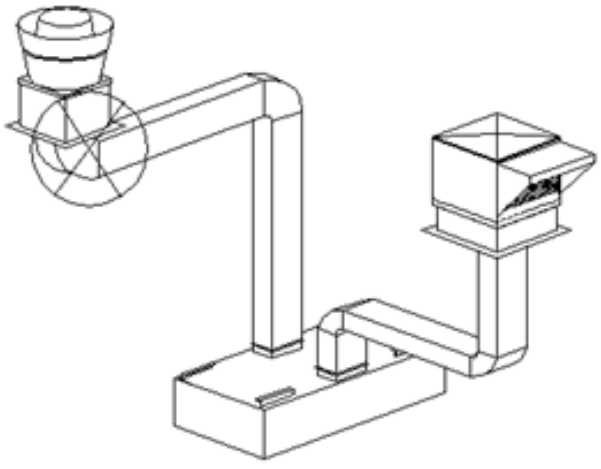
Duct Routing Examples

Proper Duct Routing

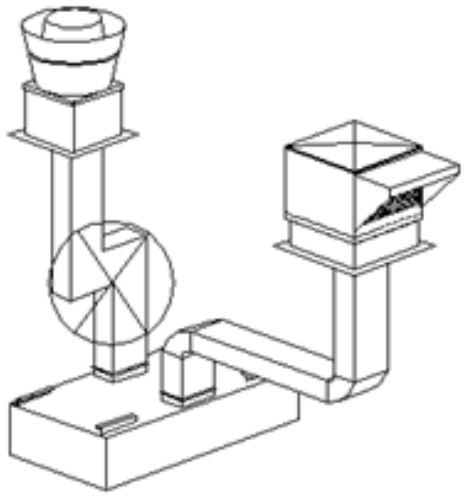


If duct cannot go straight up
use offsets

Improper Duct Routing

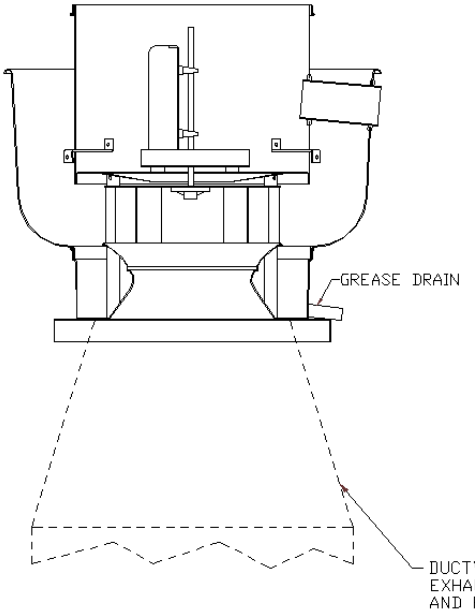


DO NOT connect Elbow DIrecty
to Fan Inlet.



DO NOT use square elbows

Up-Blast Roof Mount Installation



FEATURES:

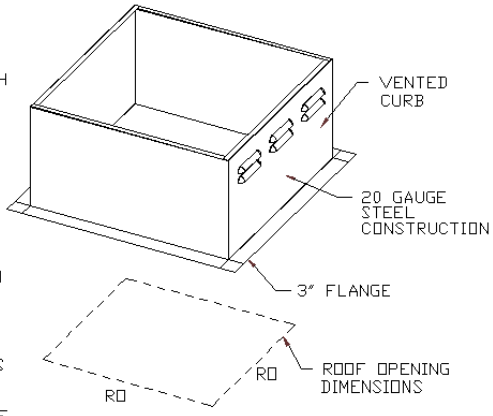
- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL762
- AMCA SOUND AND AIR CERTIFIED
- WIRING FROM MOTOR TO DISCONNECT SWITCH
- WEATHERPROOF DISCONNECT
- HIGH HEAT OPERATION 300°F (149°C)
- GREASE CLASSIFICATION TESTING

NORMAL TEMPERATURE TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

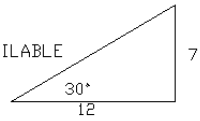
ABNORMAL FLARE-UP TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

OPTIONS:

GREASE BOX
HINGED FAN
PITCHED CURB
INSULATED CURB



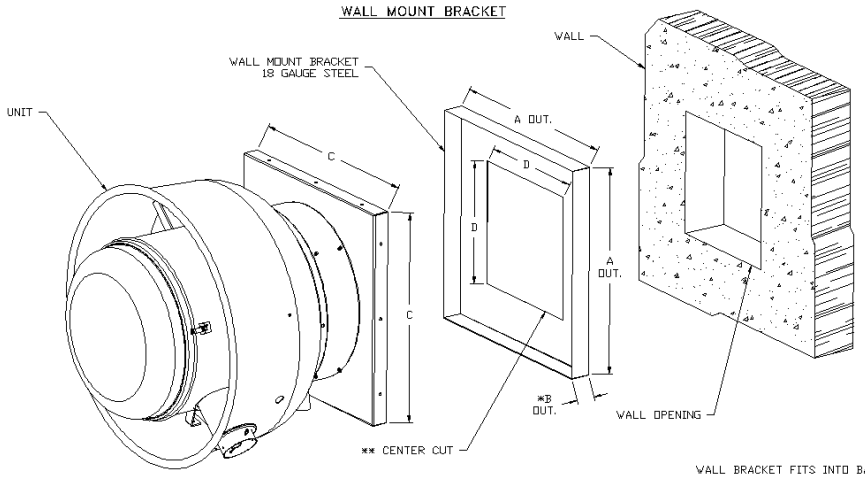
PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.



SPECIFY PITCH:
EXAMPLE: 7/12 PITCH = 30° SLOPE

Up-Blast Wall Mount Installation

WALL MOUNT BRACKET
REV.#E 09/22/03



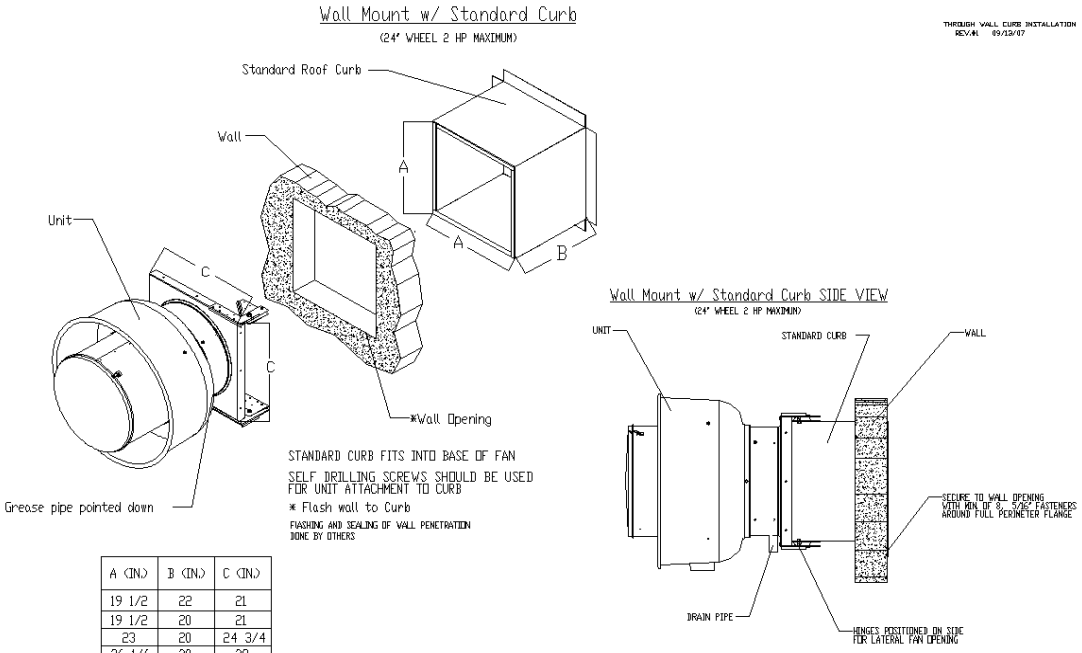
A OUT.	B OUT.	C	D
18 1/2	2	19	13
20 1/2	2	21	16
21 1/2	2	22	16
24 1/4	2	24 3/4	20
25 1/2	2	26	20
27 1/2	2	28	24
32 1/2	2	33	28

WALL BRACKET FITS INTO BASE OF FAN

SELF DRILLING SCREWS SHOULD BE USED FOR UNIT ATTACHMENT TO WALL MOUNT BRACKET

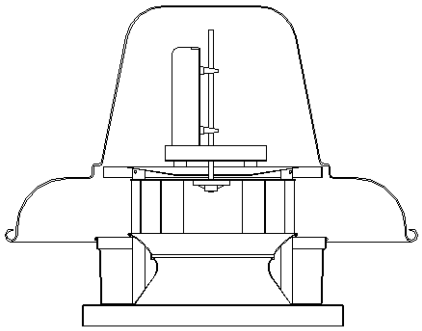
* "B" DIMENSION = 5" WHEN USED WITH DAMPER
** CENTERED IN WALL MOUNT

Up-Blast Through Wall Mount Installation



A (IN.)	B (IN.)	C (IN.)
19 1/2	22	21
19 1/2	20	21
23	20	24 3/4
26 1/6	20	28
26 1/2	20	28
31 1/2	20	33

Down-Blast Installation

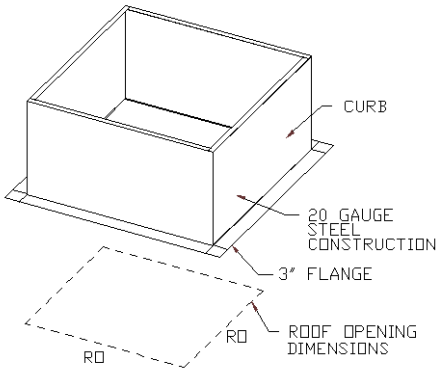


FEATURES:

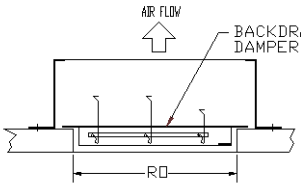
- ROOF MOUNTED FANS
- UL705
- AMCA SOUND AND AIR CERTIFIED
- WIRING FROM MOTOR TO DISCONNECT SWITCH
- DISCONNECT SWITCH
- STANDARD BIRD SCREEN

OPTIONS:

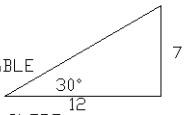
HINGED FAN
PITCHED CURB
INSULATED CURB
BACKDRAFT DAMPER



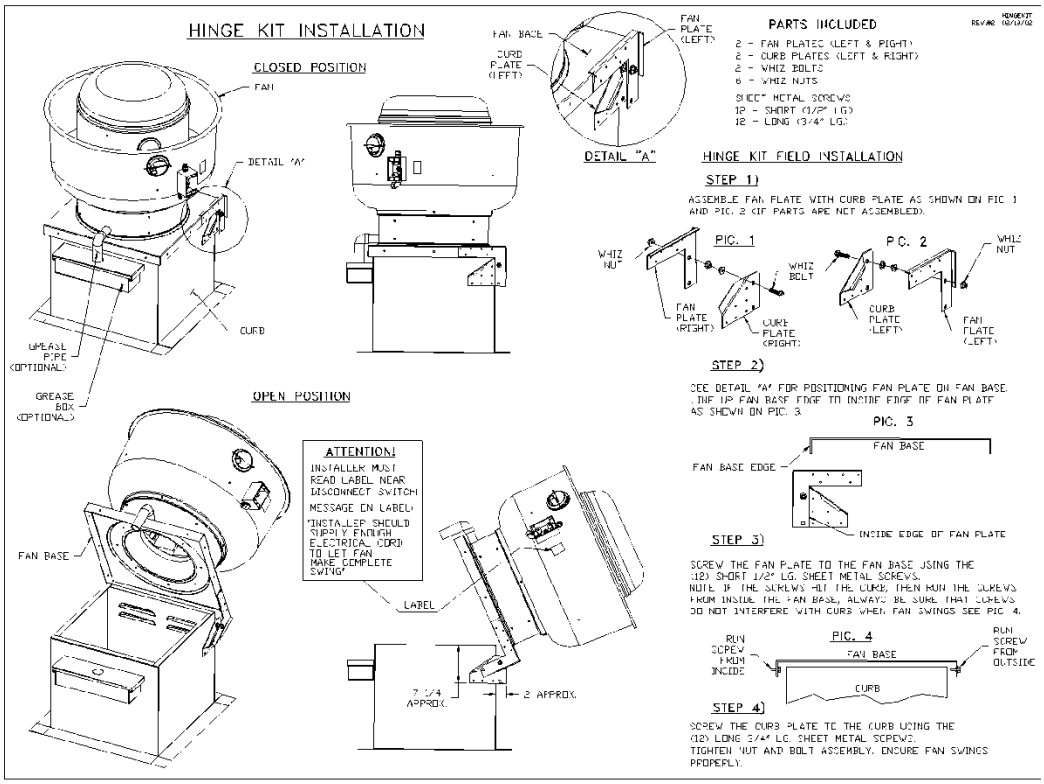
BACKDRAFT DAMPER INSTALLATION



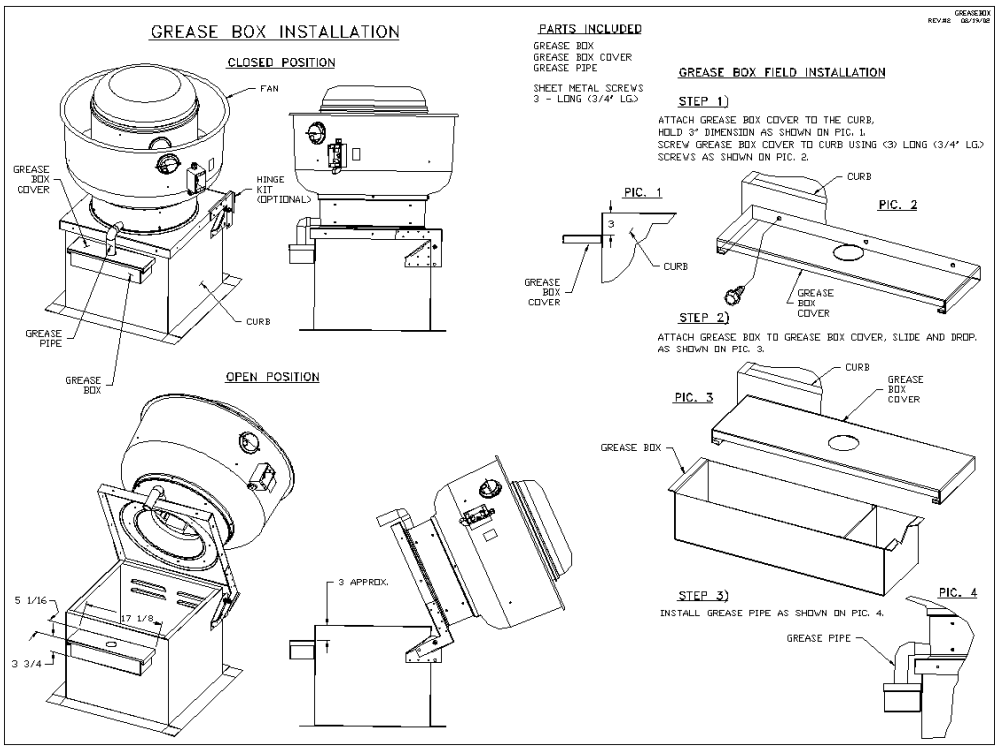
PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.
SPECIFY PITCH:
EXAMPLE: 7/12 PITCH = 30° SLOPE



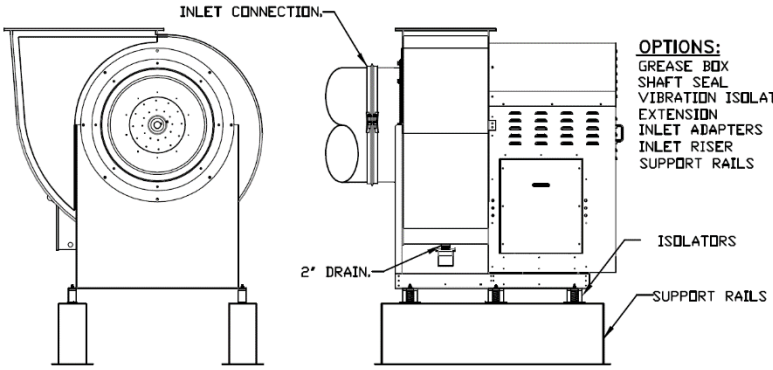
Typical Hinge Kit – Centrifugal Upblast



Typical Grease Box Installation

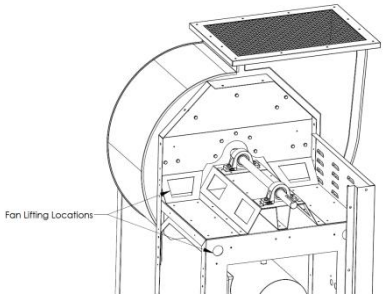


Up-Blast Utility Set Installation



OPTIONS:
GREASE BOX
SHAFT SEAL
VIBRATION ISOLATORS
EXTENSION
INLET ADAPTERS
INLET RISER
SUPPORT RAILS

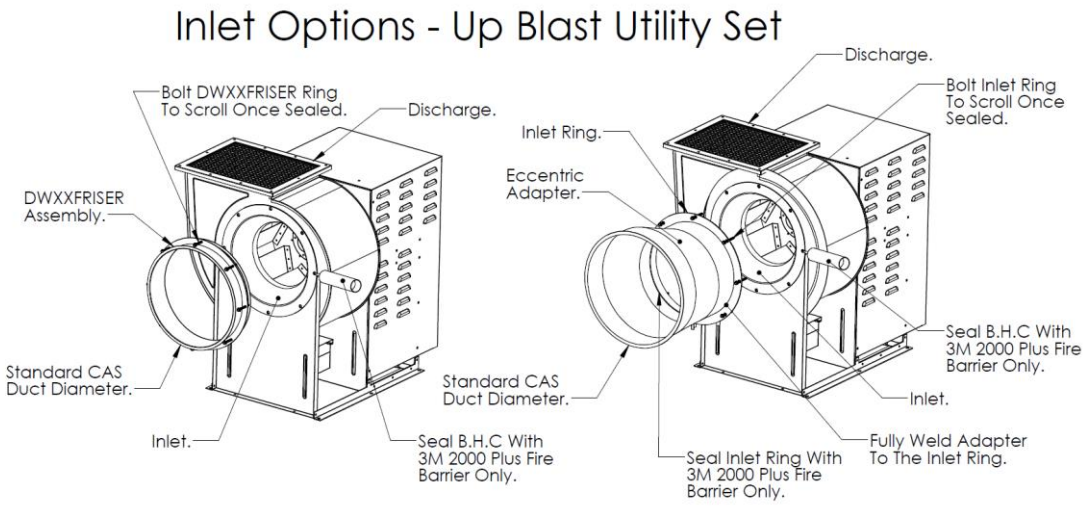
FEATURES:
- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL705
- UL762
- HIGH HEAT OPERATION DIRECT DRIVE 350°F (176°C)
- HIGH HEAT OPERATION BELT DRIVE 350°F (176°C)
- HEAT SLINGER
- GREASE CLASSIFICATION TESTING
- 2" DRAIN
- MOTOR WEATHER COVER
- FULLY SEALED SCROLL HOUSING
- SCROLL ACCESS DOOR
- FLANGE 1 1/4" - 11 THRU 20.
- FLANGE 2" - 24 THRU 36.



NORMAL TEMPERATURE TEST BELT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 350°F (176°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

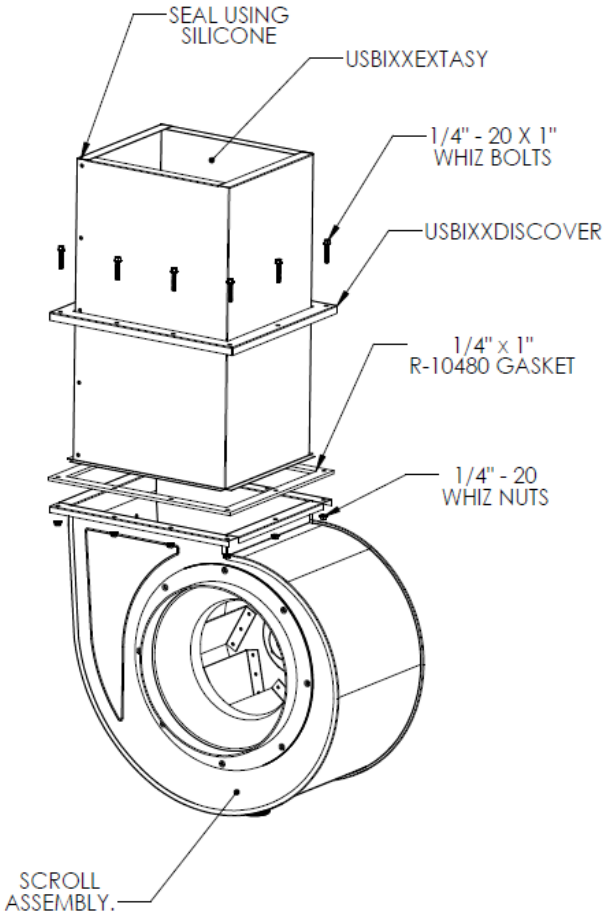
NORMAL TEMPERATURE TEST DIRECT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 350°F (176°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

Up-Blast Utility Set Inlet Options



Inlet Connections						
Fan Size	Duct Diameter	Inlet Connection	B.H.C.	Inlet Ring OD	Hardware #	Hardware Qty
11	12"	DW12FRISER	13.375"	12.500"	1/4" - 20 x 1 1/2" (92323A523)	8
13	14"	DW14FRISER	15.375"	13.500"	1/4" - 20 x 1 1/2" (92323A523)	8
15	16"	DW16FRISER	17.375"	15.250"	1/4" - 20 x 1 1/2" (92323A523)	8
18	20"	DW20FRISER	21.375"	18.500"	1/4" - 20 x 1 1/2" (92323A523)	8
20	20"	DW20FRISERUSBI20	22.375"	19.625"	1/4" - 20 x 1 1/2" (92323A523)	8
24	24"	DW24FRISERUSBI24	28.000"	25.375"	3/8" - 16 X 1 1/2" (92323A558)	8
30	24"	DW24FRISERUSBI30	26.962"	24.375"	3/8" - 16 X 1 1/2" (92323A558)	8
36	24"	DW307524ADPEC	N/A	30.500"	3/8" - 16 X 1 1/2" (92323A558)	8

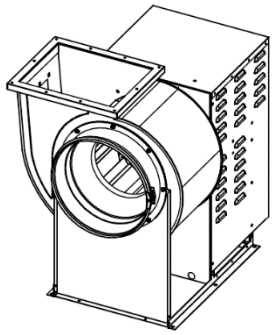
Discharge Extension Options - Up Blast Utility Set



Hardware Counts	
Hardware # Bolt / Nut	Hardware Qty
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	8
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	8
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	8
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	12
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	12
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	12
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	12
1/4" - 20 x 1" (92323A518) / 1/4" - 20 (94831A029)	14

USBI - Discharge Extension					
Fan Size	Extension #	"L"	"W"	"H"	Cover #
11	USBI11EXTASY	12"	11"	24"	USBI11DISCOVER
13	USBI13EXTASY	14"	12"	24"	USBI13DISCOVER
15	USBI15EXTASY	16"	13"	24"	USBI15DISCOVER
18	USBI18EXTASY	19"	15"	24"	USBI18DISCOVER
20	USBI20EXTASY	21"	15"	24"	USBI120DISCOVER
24	USBI24EXTASY	26"	17"	24"	USBI24DISCOVER
30	USBI30EXTASY	32"	19"	24"	USBI30DISCOVER
36	USBI36EXTASY	39"	23"	24"	USBI36DISCOVER

Up-Blast Utility Set Indoor Installation



Some situations prevent the installation of exhaust fans on the roof or other outdoor location. An indoor installation may be the only alternative.

Of the various types of fans that might be employed, utility sets seem most appropriate because they readily accommodate the inlet and outlet duct connections. Fans designed for curb mounting would present outlet duct connection difficulties.

Most jurisdictions having authority comply IMC, NFPA96 and with UL762 standards. Standard UL762 “Power Roof Ventilators for Restaurant Exhaust Appliances”, covers the utility set high temperature and grease fire testing. NFPA96 “Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations”, covers the installation of the duct connections to the inlet and out of the exhaust fan.

Standard UL762:
This standard has two primary tests. The first test has the fan exhaust air for several hours at the maximum temperature the manufacturer wishes to list the fan, such as 300 degrees F. The second part imitates a grease fire by igniting grease in a pan near an inlet duct. If the fan keeps running and does not display any unsafe results it passes those tests. They also examine the fan for any characteristics that might be unsuitable.

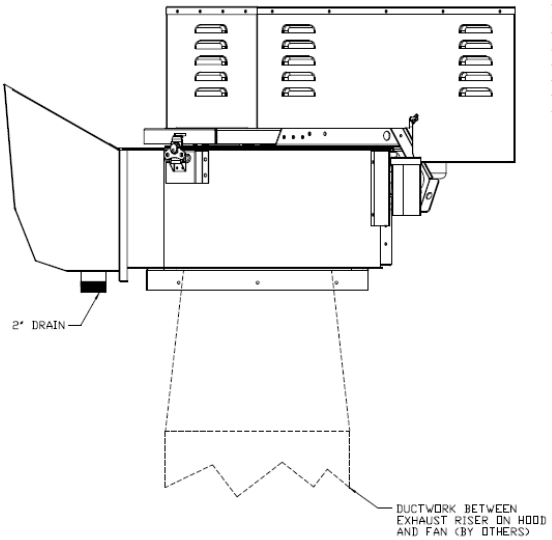
In the scope, section 1.1, it says “these requirements cover roof or wall-mounted ventilators for restaurant exhaust appliances”. It would seem at first that the phrase “roof or wall mounted” would preclude applicability of the label indoors. However, in the very next paragraph it goes on to say “Power ventilators…covered by these requirements are intended or installation in accordance with … NFPA 96”. NFPA 96 clearly defines how to install a traditional ventilator indoors.

Standard NFPA 96 – 8.1.4* Utility Set Exhaust Fans.
8.1.4.2 Utility set exhaust fans installed within the building shall be located in an accessible area of adequate size to allow for service or removal.
8.1.4.3 Where the duct system connected to the fan is in an enclosure, the space or room in which the exhaust fan is located shall have the same fire resistance rating as the enclosure.
8.1.4.4 The fan shall be connected to the exhaust duct by flanges securely bolted as shown in Figure 8.1.3.2 (a) through Figure 8.1.3.2 (d) or by a system specifically listed for such use, such as UL1978 or UL2221 listed duct systems.
8.1.4.5 Flexible connectors shall not be used.
8.1.4.6 Exhaust fans shall have a drain directed to a readily accessible and visible grease receptacle not to exceed 3.8 L (1 gallon).

Manufactures Recommendations for Indoor Installation:

1. The fan inlet and outlet must be connected to the ducts using companion flanges and high temperature (1500F) gaskets or by a system specifically listed for such use, such as UL1978 or UL2221 listed duct systems.
2. Install the fan where there is room for service and removal.
3. Usually the duct to the fan is in a shaft and the shaft walls have a fire resistance rating. The space where the fan is located must have the same fire resistance rating as the shaft.
4. Flexible connectors are not allowed.
5. There must be a drain in the fan that is directed to a readily accessible and visible grease receptacle, ideally piped to the building grease trap.
6. The exhaust housing constructed of carbon steel not less than 1.52 mm (.060 in.), unless listed in accordance with the terms of the listing.
7. Inlet and outlet ducts will have access doors installed 3 feet from the fan for service and maintenance.
8. Minimum clearances are 18” inches to combustible, 3” inches to limited, 0” inches to non-combustibles.
9. All wiring and electrical equipment must comply with NFPA 70, National Electrical Code.

Up-Blast Curb Mount Utility Set Installation



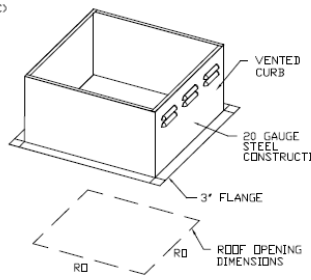
FEATURES:

- ROOF MOUNTED FANS
- RESTAURANT MODEL
- UL762
- HIGH HEAT OPERATION DIRECT DRIVE 300°F (149°C)
- HIGH HEAT OPERATION BELT DRIVE 500°F (260°C)
- HEAT SLINGER
- GREASE CLASSIFICATION TESTING
- TILT OUT WHEEL
- LOCKING PIN FOR POWER PACK
- MOTOR WEATHER COVER

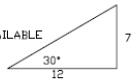
NORMAL TEMPERATURE TEST BELT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 500°F (260°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

NORMAL TEMPERATURE TEST DIRECT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

ABNORMAL FLARE-UP TEST BELT & DIRECT DRIVE
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

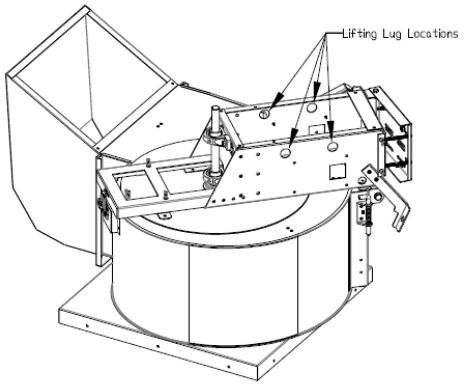


PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.

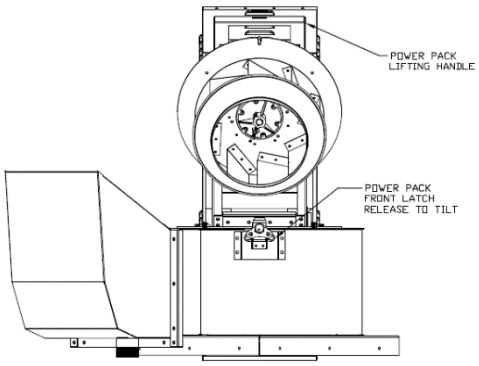


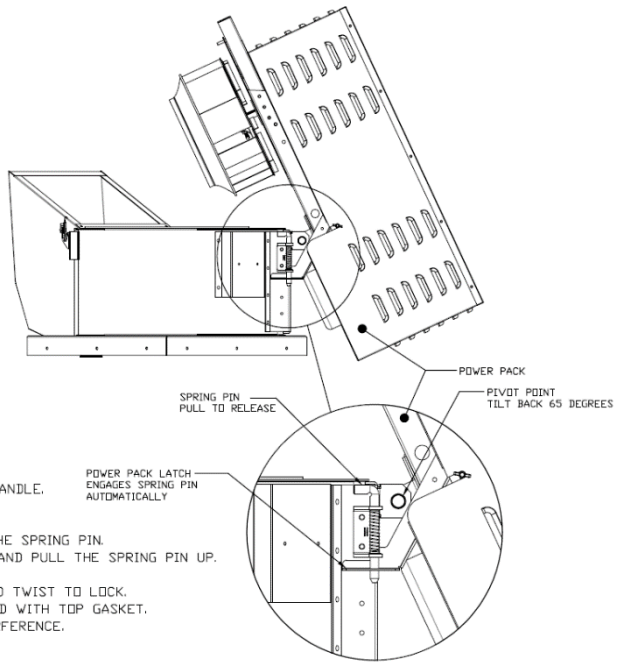
SPECIFY PITCH:
EXAMPLE: 7/12 PITCH = 30° SLOPE

OPTIONS:
GREASE BOX
PITCHED CURB
INSULATED CURB
RAIN CAP



Up-Blast Curb Mounted Utility Set Hinging Instructions



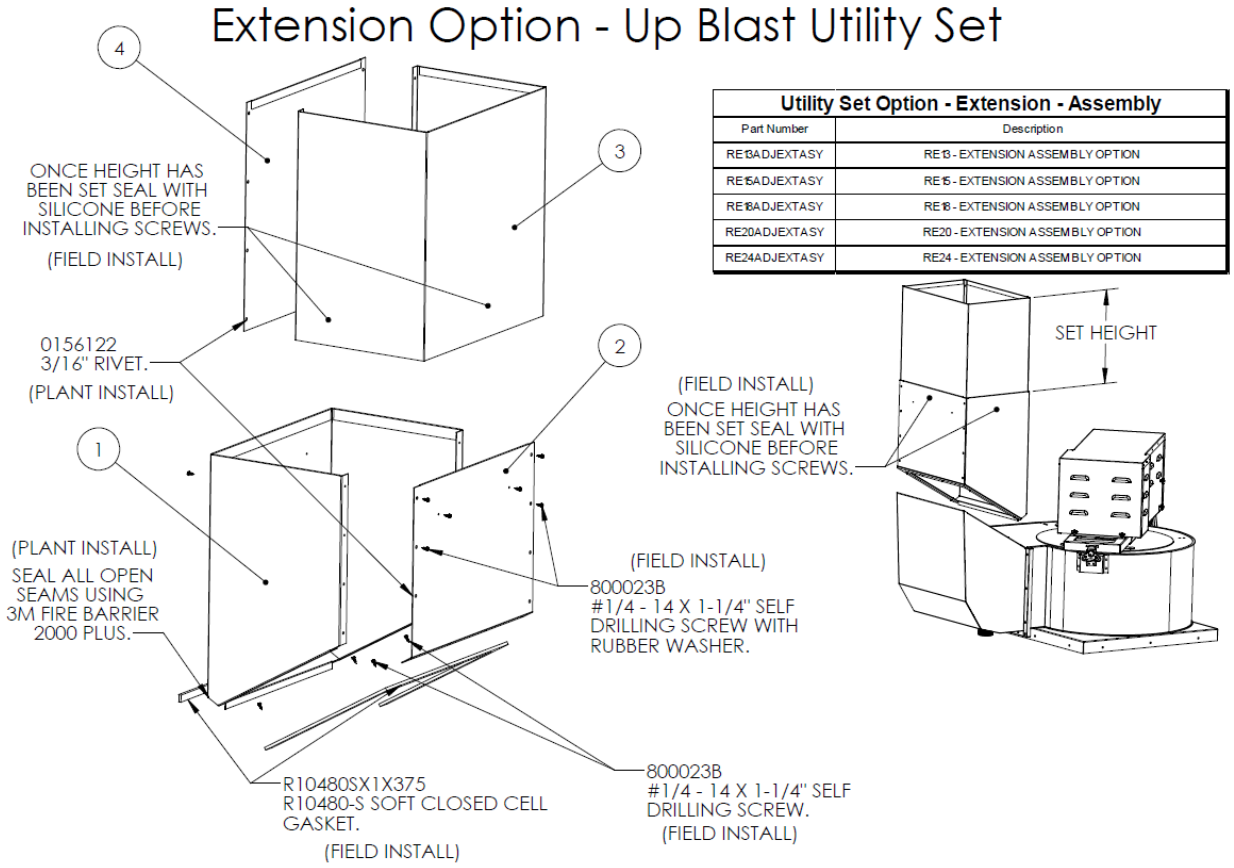


UTILITY SETS MAY NOT BE WALL MOUNTED

HINGING INSTRUCTIONS:

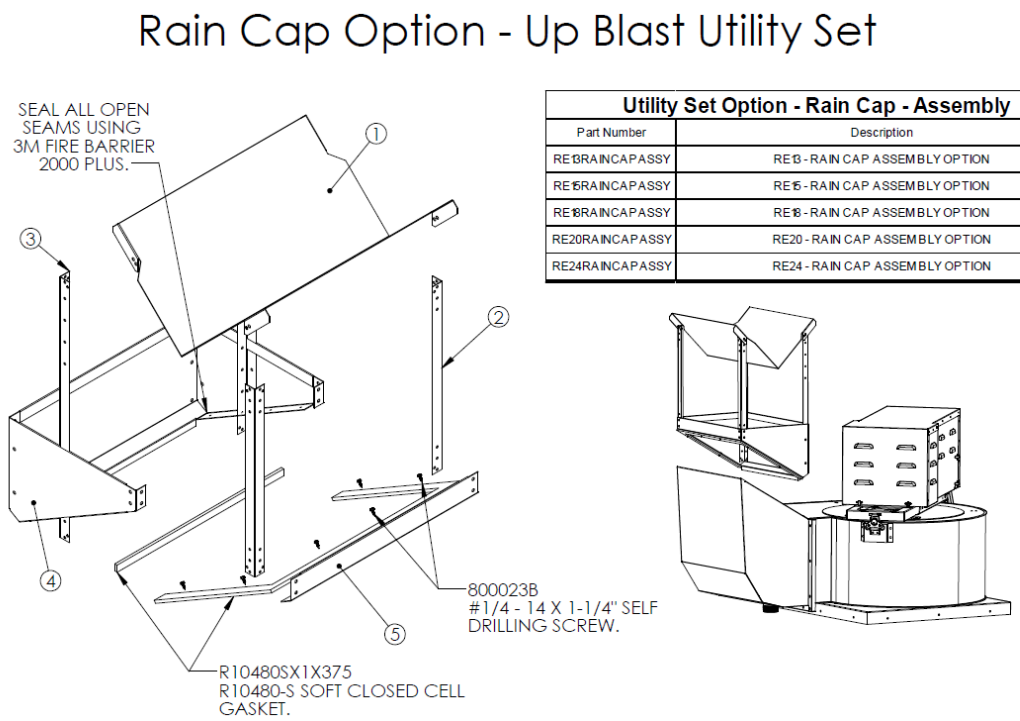
1 - TURN THE DISCONNECT TO THE OFF POSITION.
2 - TURN AND RELEASE THE LATCH FROM THE POWER PACK HANDLE.
3 - LIFT THE POWER PACK USING THE FRONT HANDLE.
4 - THE POWER PACK WILL TILT BACK 65 DEGREES.
5 - THE POWER PACK LATCH WILL AUTOMATICALLY ENGAGE THE SPRING PIN.
6 - TO CLOSE THE POWER PACK, HOLD THE LIFTING HANDLE AND PULL THE SPRING PIN UP.
7 - LOWER THE POWER PACK DOWN.
8 - ENGAGE THE FRONT LATCH INTO THE LIFTING HANDLE AND TWIST TO LOCK.
9 - INSPECT THE POWER PACK. TOP PLATE SHOULD BE SEALED WITH TOP GASKET.
10 - TURN THE WHEEL TO MAKE SURE THERE ISN'T ANY INTERFERENCE.

Up-Blast Curb Mounted Utility Set Discharge Extension Option



Utility Set Option - Extension - Assembly	
Part Number	Description
RE13ADJEXTASY	RE13 - EXTENSION ASSEMBLY OPTION
RE15ADJEXTASY	RE15 - EXTENSION ASSEMBLY OPTION
RE18ADJEXTASY	RE18 - EXTENSION ASSEMBLY OPTION
RE20ADJEXTASY	RE20 - EXTENSION ASSEMBLY OPTION
RE24ADJEXTASY	RE24 - EXTENSION ASSEMBLY OPTION

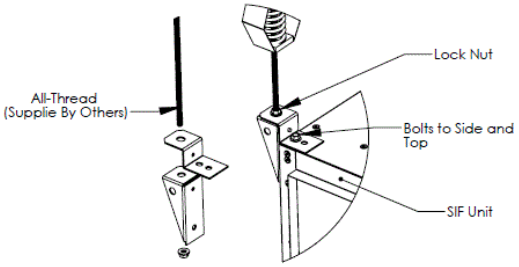
Up-Blast Curb Mounted Utility Set Rain Cap Option



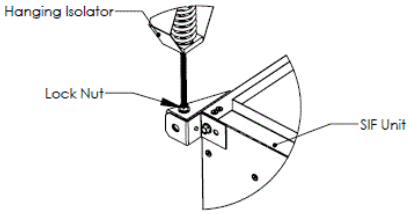
Utility Set Option - Rain Cap - Assembly	
Part Number	Description
RE13RAINCAPASSY	RE13 - RAIN CAP ASSEMBLY OPTION
RE15RAINCAPASSY	RE15 - RAIN CAP ASSEMBLY OPTION
RE18RAINCAPASSY	RE18 - RAIN CAP ASSEMBLY OPTION
RE20RAINCAPASSY	RE20 - RAIN CAP ASSEMBLY OPTION
RE24RAINCAPASSY	RE24 - RAIN CAP ASSEMBLY OPTION

Square Inline Mounting Bracket Detail

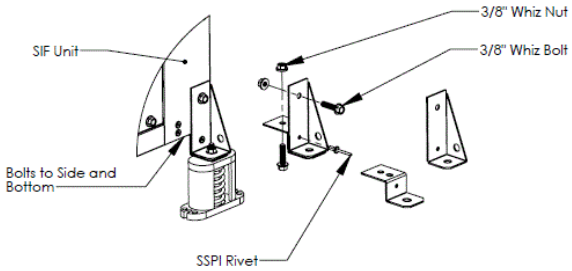
Horizontal Overhead Mount



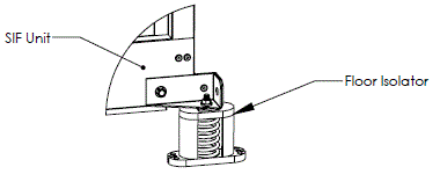
Vertical Overhead Mount



Horizontal Floor Mount

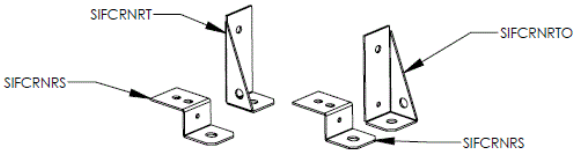


Vertical Floor Mount

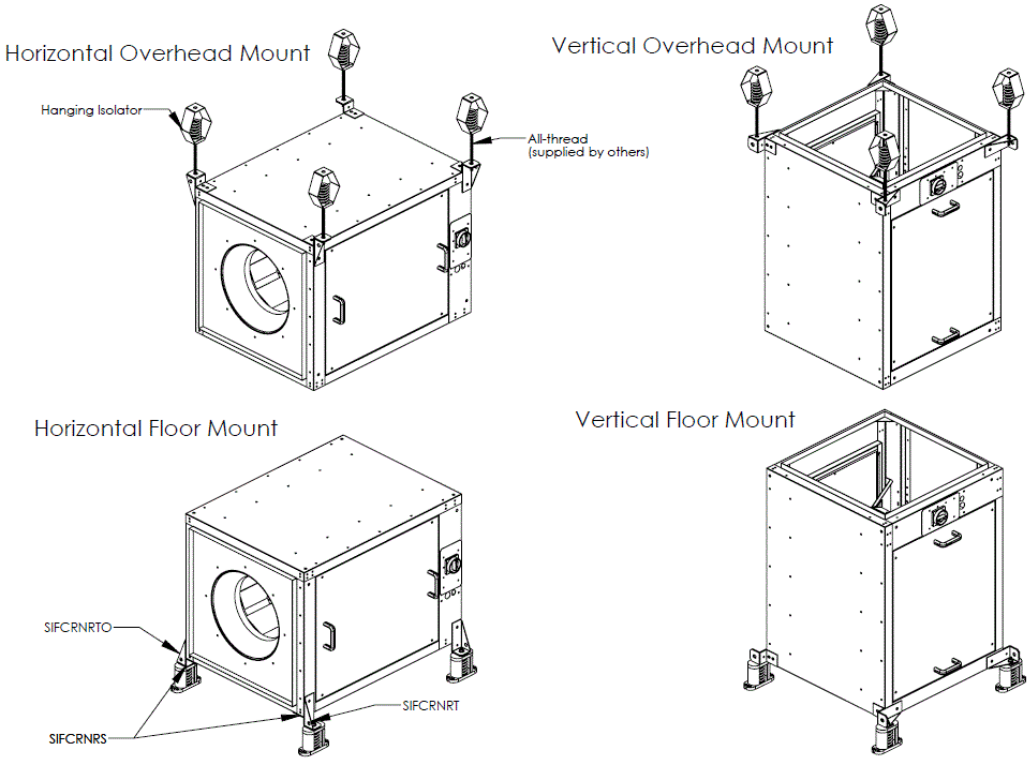


Each Mounting configuration requires:

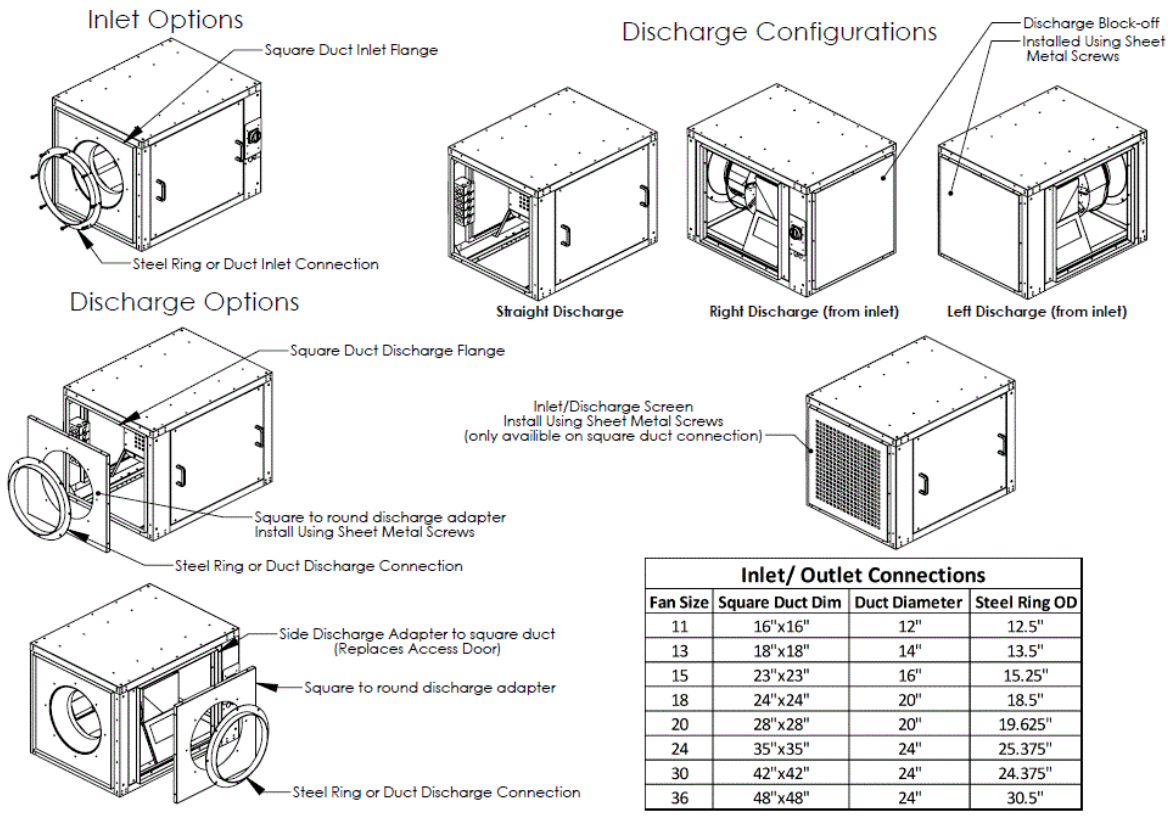
- (2) SIFCRNRT
- (2) SIFCRNRTO
- (4) SIFCRNRS



Square Inline Mounting Configurations

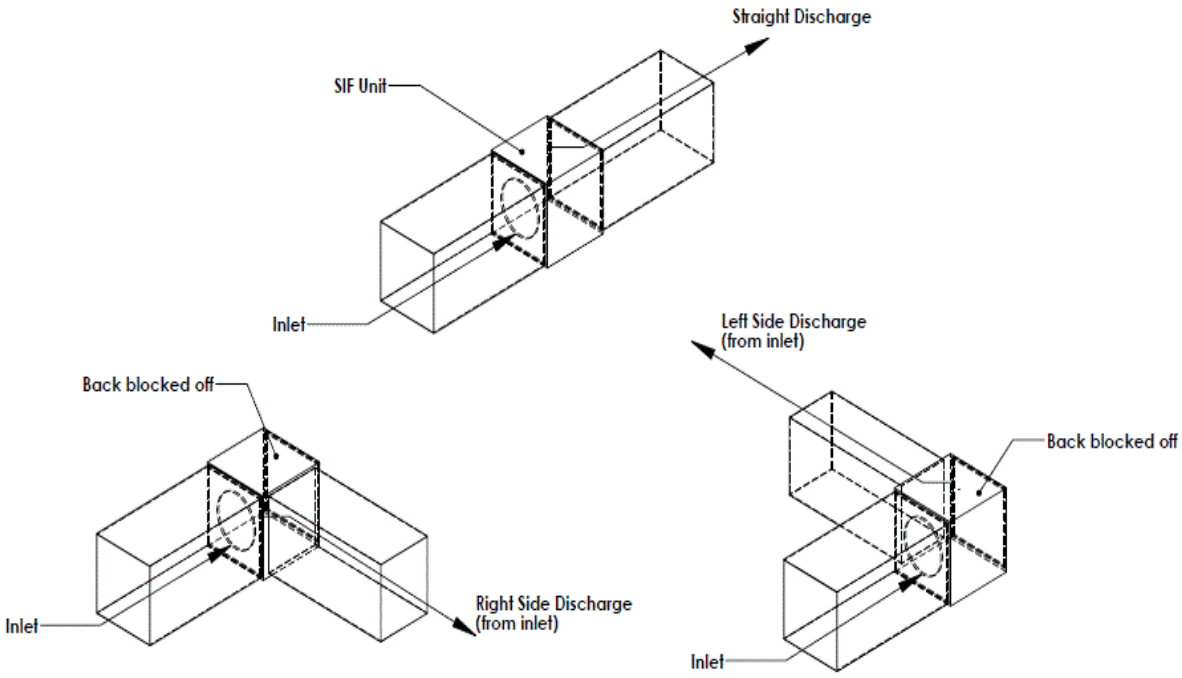


Square Inline Discharge Options



Inlet/ Outlet Connections			
Fan Size	Square Duct Dim	Duct Diameter	Steel Ring OD
11	16"x16"	12"	12.5"
13	18"x18"	14"	13.5"
15	23"x23"	16"	15.25"
18	24"x24"	20"	18.5"
20	28"x28"	20"	19.625"
24	35"x35"	24"	25.375"
30	42"x42"	24"	24.375"
36	48"x48"	24"	30.5"

Square Inline Discharge Configurations



Electrical

Before connecting power to the fan, read and understand this entire section of this document. As-built wiring diagrams are available with each fan by the factory.

Electrical wiring and connections should be done in accordance with local ordinances and the National Electric Code, ANSI/NFPA70. Be sure the voltage and phase of the power supply and the wire amperage capacity is in accordance with the motor nameplate. For additional safety information refer to AMCA publication 410-96, *Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans.*

WARNING!!

Disconnect power before installing or servicing fan. High voltage electrical input is needed for this equipment. This work should be performed by a qualified electrician.

Copper Wire Ampacity

Wire Size AWG	Maximum Amps
14	15
12	20
10	30
8	50
6	65
4	85

1. Always **disconnect power** before working on or near a fan. Lock and tag the disconnect switch or breaker to prevent accidental power up.
2. A disconnect switch is shipped with every fan. The switch is located on the exterior of up-blast fans and in the interior of down-blast fans. On down-blast direct drive fans, the disconnect function is built into the speed controller.
3. A dedicated branch circuit should supply the motor circuit with short circuit protection according to the National Electric Code. This dedicated branch should be run to the junction box mentioned above and connected as shown in a following illustration labeled “Fan to Building Wiring Connection”.
4. Make certain that the power source is compatible with the requirements of your equipment. The fan nameplate identifies the **proper phase and voltage** of the motor.
5. Before connecting fan to building power source, verify power line wiring is de-energized.
6. Secure the power cable to prevent contact with sharp objects.
7. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces or chemicals.
8. Before powering up fan check fan wheel for free rotation and make sure that the interior of the fan is free of loose debris or shipping materials.
9. If any of the original wire supplied with the fan must be replaced, it must be replaced with type TW wire or equivalent.

IMPORTANT: FANS WITH HINGE KITS REQUIRE ENOUGH SLACK IN THE WIRING TO THE FAN TO ALLOW FAN TO TILT BACK TO THE OPEN POSITION. ELECTRICIAN MUST CHECK THIS AND ACCOUNT FOR THE RANGE OF MOTION OF THE FAN.

Motorized Damper

On units shipped with the optional motorized damper, power must be supplied to the damper according to the damper nameplate. The damper motor is controlled external to the fan. E**xternal wiring to the damper motor is required**.

PSC (Permanent Split Capacitor) Motor Speed Control

Some single phase direct drive fans contain speed controls that regulate the amount of voltage going to the motor. Specific PSC motors must be used in conjunction with speed controls. The speed control has a knob with an off position, and high to low range. At high speed, the speed control allows all of the line voltage to pass right to the motor.

A minimum speed adjustment is provided to allow independent control of the minimum speed setting. Minimum speed adjustment ensures motor runs with sufficient torque to prevent stalling. To adjust this:

1) Motor must be in actual operating conditions to achieve proper speed adjustment. Motor will not slow down unless proper load is applied.
2) Turn main control knob to lowest speed position.
3) Locate and adjust minimum speed setting and adjust with small screw driver. This can be found under the speed control faceplate, (rotate clockwise to decrease minimum speed; counter-clockwise to increase minimum speed).
4) Motor will now operate from this preset minimum speed to full speed.

The lowest minimum voltage that may be applied to these motors is 65VAC. Running lower voltages to the motor can cause premature failure and overheating problems.

Electronically Commutated Motor (ECM) Speed Control

EC Motors and controls allow accurate manual adjustment of fan speed. The benefits of using an EC Motor are exceptional efficiency, performance, and motor life.

NOTE: To adjust the speed of 3 phase direct drive motors, a variable frequency drive is required.

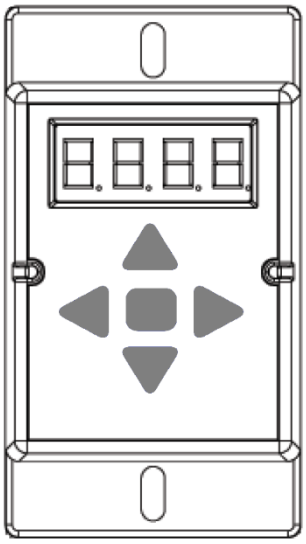
EVO EC Motor Control

The control unit features a 4 digit LED numerical display. The knob on the unit allows the user to set the flow index with a screwdriver. Twenty seconds later, the display shows the motor RPM. Then, the display periodically alternates between the flow index and motor RPM. The flow index has a range of 0 to 100% and is typically linear with motor RPM.

The EC Motor control requires a **24VAC** input and can locally turn the motor on and off. The motor can be adjusted between 300 RPM and maximum speed with this control.

RTC FSC-1 Motor Control

The control unit features a 4 digit LED display, with a five button interface. All parameters can be accessed through the user menu. The percent of run speed can be changed by using the Up, and Down buttons, followed by pressing Enter (middle button) to save changes. Every **ten seconds** the display will toggle between current percentage of run speed, and current RPMs. The flow index has a range of **0-100%** and is typically linear with motor RPM.

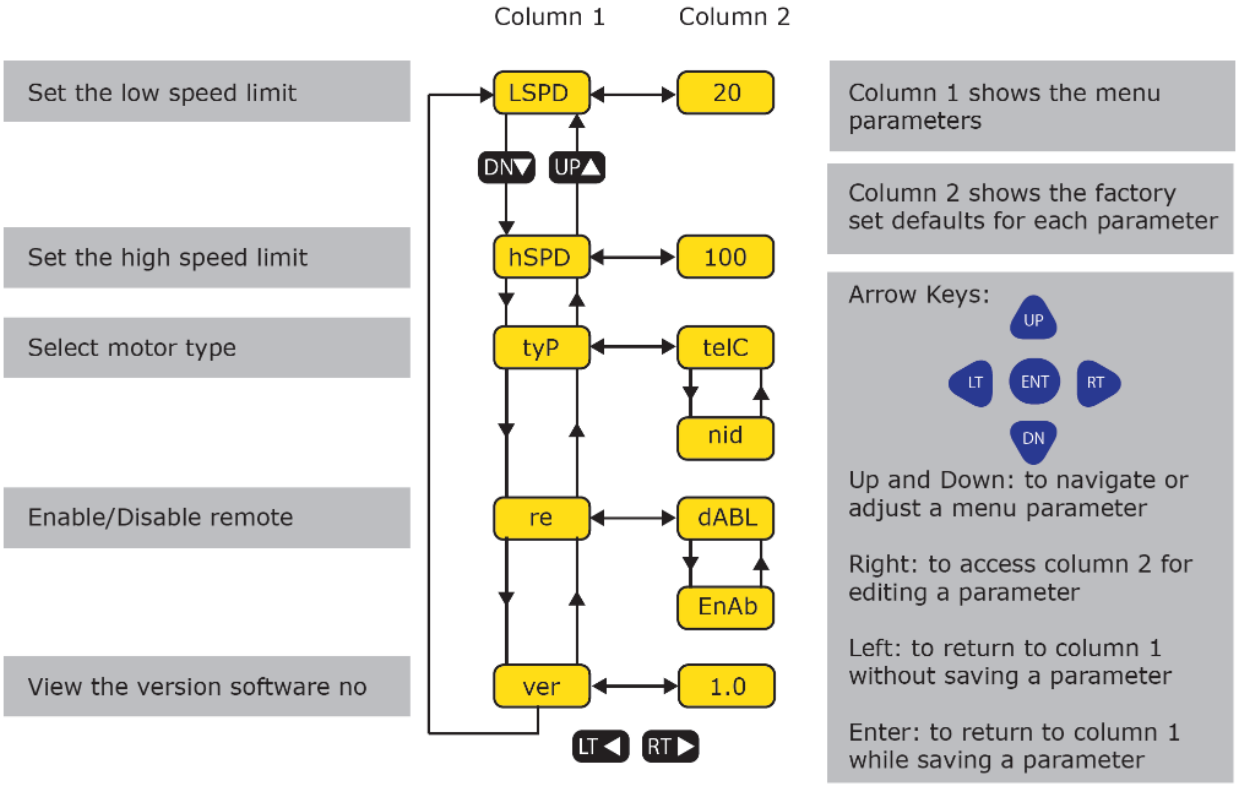


If the remote function (re) is enabled, the speed is controlled through a **0-10V** input. **0V = 0%** and **10V = 100%**, unless overridden by the low speed and high speed limits.

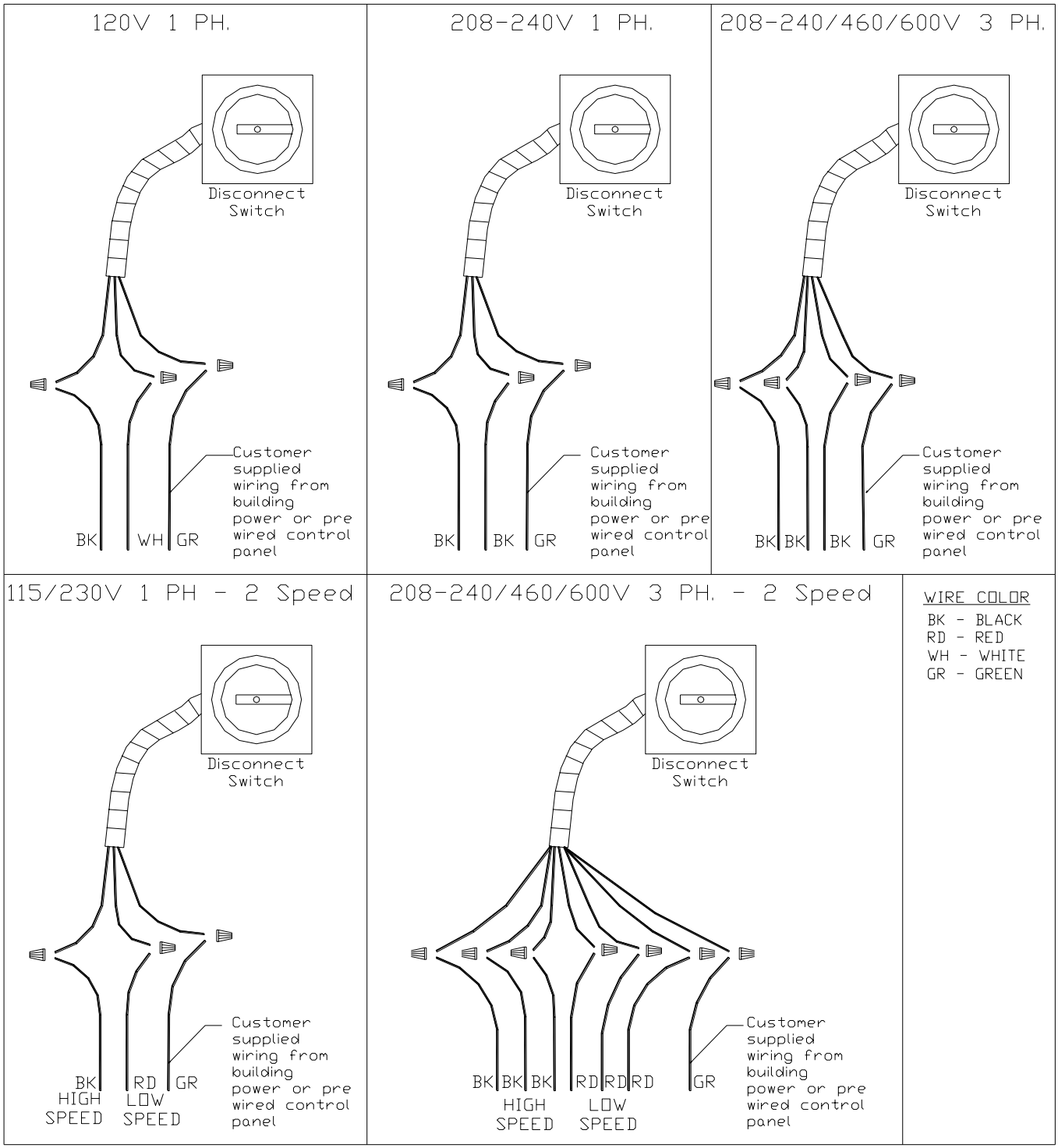
The EC Motor control requires a **24VAC** input and can locally turn the motor on and off. The motor RPM range is fully adjustable between the minimum and maximum set points, see LSPD and HSPD on the programming display. For more information see the control operating manual.

If “oFF” is being displayed, and the speed is set above 300 RPM, the ECM is not receiving RPM feedback. Check that the ECM is wired correctly. Check that the motor “tyP” in the settings matches the motor manufacturer.

Programming Map RTC FSC-1



Fan to Building Wiring Connection



Variable Frequency Drive (VFD) Installation Instructions

Input AC Power

1. Circuit breakers feeding the VFDs are recommended to be thermal-magnetic and fast acting. They should be sized based on the VFD amperage and according to the table below. Refer to the installation schematic for exact breaker sizing.
2. Each VFD should be fed by its own breaker. If multiple VFDs are to be combined on the same breaker, each drive should have its own protection measure (fuses or miniature circuit breaker) downstream from the breaker.
3. Input AC line wires should be run in conduit from the breaker panel to the drives. AC input power to multiple VFDs can be run in a single conduit if needed. **Do not combine input and output power cables in the same conduit.**
4. The VFD should be grounded on the terminal marked PE. A separate insulated ground wire must be provided to each VFD from the electrical panel. This will reduce the noise being radiated in other equipment.

ATTENTION!
DO NOT CONNECT INCOMING AC POWER TO OUTPUT TERMINALS U, V, W. SEVERE DAMAGE TO THE DRIVE WILL RESULT. INPUT POWER MUST ALWAYS BE WIRED TO THE INPUT L TERMINAL CONNECTIONS (L1, L2, L3)

VFD Output Power

1. Motor wires from each VFD to its respective motor MUST be run in a **separate steel** conduit away from control wiring and incoming AC power wiring to avoid noise and crosstalk between drives. An insulated ground must be run from each VFD to its respective motor. Do not run different fans output power cables in the same conduit.
2. Load reactors: If the distance between the VFD and the motor is great, a load reactor should be used between the VFD and the motor. The output reactor should be sized accordingly and installed within 10 feet of the output of the VFD. 208/230V – Load reactor should be used when distance exceeds 250 feet. 460/480V – Load reactor should be used when distance exceeds 50 feet. 575/600V– Load reactor should be used when distance exceeds 25 feet.
3. If the distance between the VFD and the motor is extremely long, up to 1000 FT, a dV/dT filter should be used and the VFD should be increased by 1 HP or to the next size VFD. The dV/dT filter should be sized accordingly and installed within 10 feet of the output of the VFD.
   208/230V – dV/dT filter should be used when distance exceeds 400 feet.
   460/480V – dV/dT filter should be used when distance exceeds 250 feet.
   575/600V – dV/dT filter should be used when distance exceeds 150 feet.
4. No contactor should be installed between the drive and the motor. Operating such a device while the drive is running can potentially cause damage to the power components of the drive.
5. When a disconnect switch is installed between the drive and motor, the disconnect should only be operated when the drive is in a STOP state.

VFD Programming

Programming

1. The Drive should be programmed for the proper motor voltage. P107 is set to 0 (Low) if motor voltage is 120 VAC, 208 VAC or 400 VAC. P107 is set to 1 (High) if motor voltage is 230 VAC,480 VAC or 575 VAC.
2. The Drive should be programmed for the proper motor overload value. P108 is calculated as Motor FLA x 100 / Drive Output Rating (available in table below).

To enter the PROGRAM mode to access the parameters:

1. Press the Mode (M) button. This will activate the password prompt (PASS).
2. Use the Up and Down buttons to scroll to the password value (the factory default password is “0225”) and press the Mode (M) button. Once the correct password is entered, the display will read “P100”, which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu.
3. Use the Up and Down buttons to scroll to the desired parameter number..
4. Once the desired parameter is found, press the Mode (M) button to display the present parameter setting. The parameter value will begin blinking, indicating that the present parameter setting is being displayed. The value of the parameter can be changed by using the Up and Down buttons.
5. Pressing the Mode (M) button will store the new setting and also exit the PROGRAM mode. To change another parameter, press the Mode (M) button again to re-enter the PROGRAM mode. If the Mode button is pressed within 1 minute of exiting the PROGRAM mode, the password is not required to access the parameters. After one minute, the password must be re-entered in order to access the parameters again.

P500 parameter provides a history of the last 8 faults on the drive. It can be accessed without getting into PROGRAM mode.

ACTECH SMV VFD CROSS-REFERENCE TABLE

Model Number	Volts	1Ø input	3Ø input	HP	Input Amps 1Ø 120VAC	Input Amps 1Ø 240VAC	Output Amps	Breaker 1Ø 120VAC	Breaker 1Ø 240VAC
ESV251N01SXB	120/240V	X		0.33	6.8	3.4	1.7	15	15
ESV371N01SXB	120/240V	X		0.5	9.2	4.6	2.4	15	15
ESV751N01SXB	120/240V	X		1	16.6	8.3	4.2	25	15
ESV112N01SXB	120/240V	X		1.5	20	10	6	30	20
					Input Amps 1Ø	input Amps 3Ø		Breaker 1Ø	Breaker 3Ø
ESV371N02YXB	240V	X	X	0.5	5.1	2.9	2.4	15	15
ESV751N02YXB	240V	X	X	1	8.8	5	4.2	15	15
ESV112N02YXB	240V	X	X	1.5	12	6.9	6	20	15
ESV152N02YXB	240V	X	X	2	13.3	8.1	7	25	15
ESV222N02YXB	240V	X	X	3	17.1	10.8	9.6	30	20
ESV402N02TXB	240V		X	5		18.6	16.5		30
ESV552N02TXB	240V		X	7.5		26	23		40
ESV752N02TXB	240V		X	10		33	29		50
ESV113N02TXB	240V		X	15		48	42		80
ESV153N02TXB	240V		X	20		59	54		90
ESV751N04TXB	480V		X	1		2.5	2.1		15
ESV112N04TXB	480V		X	1.5		3.6	3		15
ESV152N04TXB	480V		X	2		4.1	3.5		15
ESV222N04TXB	480V		X	3		5.4	4.8		15
ESV402N04TXB	480V		X	5		9.3	8.2		15
ESV552N04TXB	480V		X	7.5		12.4	11		20
ESV752N04TXB	480V		X	10		15.8	14		25
ESV113N04TXB	480V		X	15		24	21		40
ESV153N04TXB	480V		X	20		31	27		50
ESV183N04TXB	480V		X	25		38	34		70
ESV223N04TXB	480V		X	30		45	40		80
ESV303N04TXB	480V		X	40		59	52		100
ESV373N04TXB	480V		X	50		74	65		125
ESV453N04TXB	480V		X	60		87	77		150
ESV751N06TXB	600V		X	1		2	1.7		15
ESV152N06TXB	600V		X	2		3.2	2.7		15
ESV222N06TXB	600V		X	3		4.4	3.9		15
ESV402N06TXB	600V		X	5		6.8	6.1		15
ESV552N06TXB	600V		X	7.5		10.2	9		20
ESV752N06TXB	600V		X	10		12.4	11		20
ESV113N06TXB	600V		X	15		19.7	17		30
ESV153N06TXB	600V		X	20		25	22		40
ESV183N06TXB	600V		X	25		31	27		50
ESV223N06TXB	600V		X	30		36	32		60
ESV303N06TXB	600V		X	40		47	41		70
ESV373N06TXB	600V		X	50		59	52		90
ESV453N06TXB	600V		X	60		71	62		110

OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan **OFF** or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

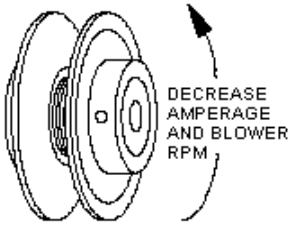
Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Check pulley alignment and belt tension as described below for belt drive fans.
3. Inspect the condition of the damper and damper linkage, if provided.
4. Inspect the air-stream for obstructions or debris in wheel.
5. Compare the supplied **voltage** with the fan's nameplate voltage. If this does not match, correct the problem.
6. Start the fan up, by turning the external disconnect to the **ON** position, and shut it **OFF** immediately to **check rotation of the wheel** with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
7. When the fan is started up, observe the operation and check for any unusual noises.
8. Switch the external disconnect back to the **ON** position and with the air system in full operation and all ducts attached, measure the system airflow. Motor sheave (pulley) is variable pitch, and allows for an increase or decrease of the fan RPM to adjust the airflow, as shown in the illustration below. For your convenience, a RPM chart is included in the following pages. If the fan is a direct drive version, it may have a speed control to adjust speed.
9. Once the proper airflow is achieved, measure and record the fan speed with a reliable tachometer. **Caution - Excessive speed will result in motor overloading or bearing failure. Do not set fan RPMs higher than specified in the maximum RPM chart.** See the troubleshooting guide for more information.
10. Measure and record the **voltage** and **amperage** to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.
11. Once the rpm of the ventilator has been properly set, disconnect power and recheck belt tension and pulley alignment as described below.

Pulley Setscrew Torque

Thread Size	Torque (IN/Lb)
No. 10 (bushing)	32
1/4" (bushing)	72
5/16"	130

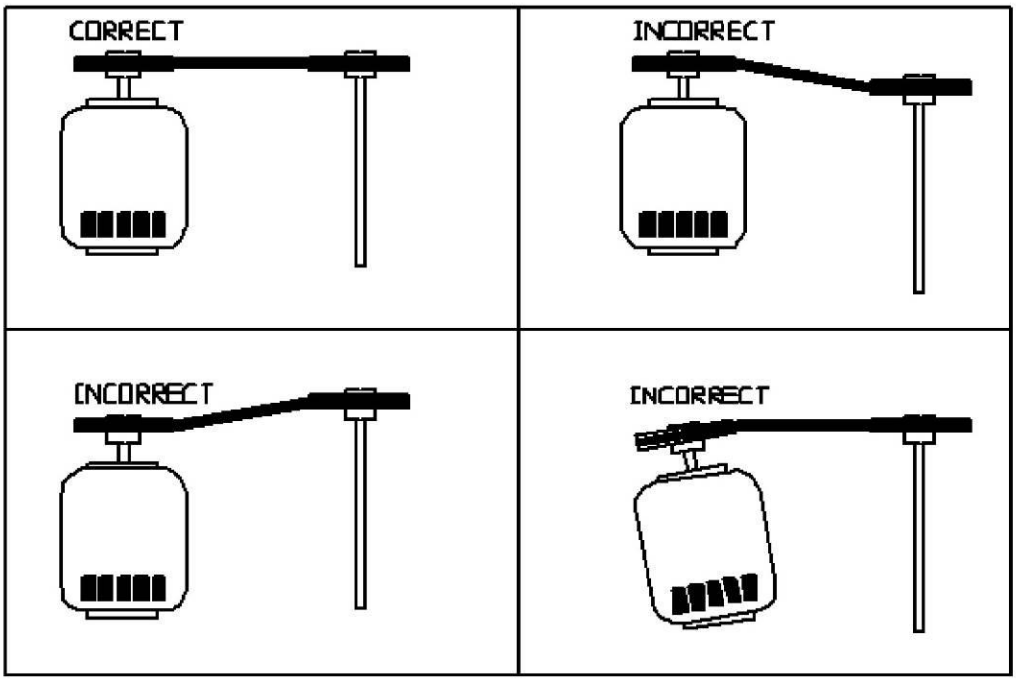
Pulley Adjustment Illustration



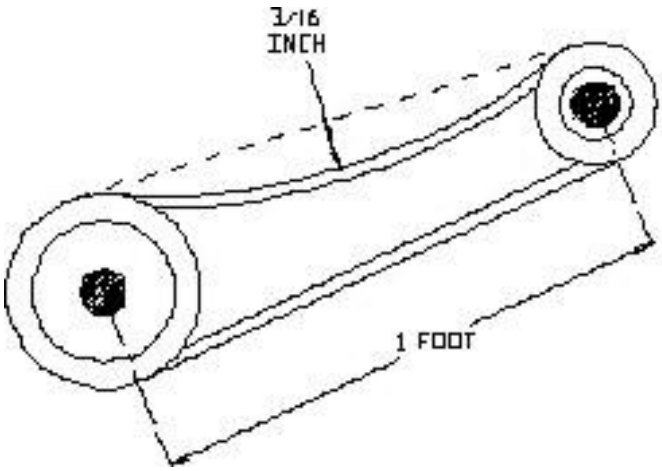
Pulley Adjustment (Belt Drive Fans)

The adjustable motor pulley is factory set for the RPM specified. Speed can be increased by closing or decreased by opening the adjustable motor sheave. Two groove variable pitch pulleys must be adjusted an equal number of turns open or closed. Any increase in speed represents a substantial increase in horsepower required by the unit. Motor amperage should always be checked to avoid serious damage to the motor when the speed is varied. Always torque setscrews according to the setscrew torque chart.

Pulley Alignment



Proper Belt Tension



Pulley Combination Chart

Motor RPM		1725													
1/3 to 1-1/2 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
AX BELTS		1VL34	1.9	2.9	2	3									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0		
AK114	11	11.2	308	323	339	354	370	385	400	416	431	447	462		

1/3 to 1-1/2 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
AX BELTS		1VL40	2.4	3.4	2.6	3.6									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0		
AK114	11	11.2	400	416	431	447	462	477	493	508	524	539	554		
AK94	9	9.2	488	506	525	544	563	581	600	619	638	656	675		
AK79	7.5	7.7	582	605	627	650	672	694	717	739	762	784	806		
AK66	6.2	6.4	701	728	755	782	809	836	863	889	916	943	970		
AK54	5	5.2	863	896	929	962	995	1028	1062	1095	1128	1161	1194		
AK46	4.2	4.4	1019	1059	1098	1137	1176	1215	1255	1294	1333	1372	1411		
AK39	3.5	3.7	1212	1259	1305	1352	1399	1445	1492	1539	1585	1632	1678		
AK32	3	3.2	1402	1455	1509	1563	1617	1671	1725	1779	1833	1887	1941		

2 to 5 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP42	2.9	3.9	3	4									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2BK160H	15.4	15.7	330	339	348	357	366	375	385	394	403	412	421	430	439
2BK140H	13.4	13.7	378	388	399	409	420	430	441	451	462	472	483	493	504
2BK120H	11.4	11.7	442	455	467	479	491	504	516	528	541	553	565	577	590
2BK110H	10.4	10.7	484	497	511	524	537	551	564	578	591	605	618	631	645
2BK100H	9.4	9.7	534	548	563	578	593	608	622	637	652	667	682	697	711
2BK90H	8.4	8.7	595	611	628	644	661	677	694	710	727	744	760	777	793
2BK80H	7.4	7.7	672	691	709	728	747	765	784	803	821	840	859	877	896
2BK70H	6.4	6.7	772	794	815	837	858	880	901	923	944	965	987	1008	1030
2BK60H	5.4	5.7	908	933	958	984	1009	1034	1059	1084	1110	1135	1160	1185	1211
2BK55H	4.9	5.2	995	1023	1050	1078	1106	1133	1161	1189	1216	1244	1272	1299	1327
2BK50H	4.4	4.7	1101	1132	1162	1193	1223	1254	1285	1315	1346	1376	1407	1438	1468

7-1/2 to 10 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP60	4.3	5.5	4.7	5.9									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2BK160H	15.4	15.7	516	527	538	549	560	571	582	593	604	615	626	637	648
2BK140H	13.4	13.7	592	604	617	630	642	655	667	680	693	705	718	730	743
2BK120H	11.4	11.7	693	708	722	737	752	767	781	796	811	826	840	855	870
2BK110H	10.4	10.7	758	774	790	806	822	838	854	871	887	903	919	935	951
2BK100H	9.4	9.7	836	854	871	889	907	925	943	960	978	996	1014	1031	1049
2BK90H	8.4	8.7	932	952	972	991	1011	1031	1051	1071	1091	1110	1130	1150	1170
2BK80H	7.4	7.7	1053	1075	1098	1120	1143	1165	1187	1210	1232	1255	1277	1299	1322

3 to 5 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP42	2.9	3.9	3	4									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2B5V278	27.8	28.1	184	189	194	200	205	210	215	220	225	230	235	240	246
2B5V250	25	25.3	205	210	216	222	227	233	239	244	250	256	261	267	273
2B5V234	23.4	23.7	218	224	230	237	243	249	255	261	267	273	279	285	291
2B5V200	20	20.3	255	262	269	276	283	290	297	304	312	319	326	333	340
2B5V184	18.4	18.7	277	284	292	300	307	315	323	331	338	346	354	361	369
2B5V160	16	16.3	317	326	335	344	353	362	370	379	388	397	406	414	423
2B5V154	15.4	15.7	330	339	348	357	366	375	385	394	403	412	421	430	439
2B5V136	12.6	12.9	401	412	423	435	446	457	468	479	490	501	513	524	535
2B5V124	12.4	12.7	407	419	430	441	453	464	475	487	498	509	521	532	543
2B5V110	11	11.3	458	471	483	496	509	522	534	547	560	572	585	598	611

7-1/2 to 10 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP60	4.3	5.5	4.7	5.9									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2B5V278	27.8	28.1	289	295	301	307	313	319	325	331	338	344	350	356	362
2B5V250	25	25.3	320	327	334	341	348	355	361	368	375	382	389	395	402
2B5V234	23.4	23.7	342	349	357	364	371	378	386	393	400	408	415	422	429
2B5V200	20	20.3	399	408	416	425	433	442	450	459	467	476	484	493	501
2B5V184	18.4	18.7	434	443	452	461	470	480	489	498	507	517	526	535	544
2B5V160	16	16.3	497	508	519	529	540	550	561	571	582	593	603	614	624
2B5V154	15.4	15.7	516	527	538	549	560	571	582	593	604	615	626	637	648
2B5V136	12.6	12.9	628	642	655	669	682	695	709	722	735	749	762	776	789
2B5V124	12.4	12.7	638	652	666	679	693	706	720	733	747	761	774	788	801
2B5V110	11	11.3	717	733	748	763	779	794	809	824	840	855	870	885	901

15 to 25 HP		MOTOR PULLEY	Dd1	Dd2	Pd1	Pd2									
BX BELTS		2VP75	5.8	7	6.2	7.4									
			Open						TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2B5V278	27.8	28.1	381	387	393	399	405	411	417	424	430	436	442	448	454
2B5V250	25	25.3	423	430	436	443	450	457	464	470	477	484	491	498	505
2B5V234	23.4	23.7	451	459	466	473	480	488	495	502	509	517	524	531	539
2B5V200	20	20.3	527	535	544	552	561	569	578	586	595	603	612	620	629
2B5V184	18.4	18.7	572	581	590	600	609	618	627	636	646	655	664	673	683
2B5V160	16	16.3	656	667	677	688	698	709	720	730	741	751	762	773	783
2B5V154	15.4	15.7	681	692	703	714	725	736	747	758	769	780	791	802	813
2B5V136	12.6	12.9	829	842	856	869	883	896	909	923	936	949	963	976	990

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in “Off” position	Turn to “On” position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Broken fan belt	Replace belt
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Fan speed is too high	Reduce fan RPM
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
	Duct static pressure lower than design	Reduce fan RPM
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
	Duct static pressure higher than design	Improve ductwork to eliminate or reduce duct losses
	Blower speed too low	Increase fan RPM. Do not overload motor
	Belt slippage	Adjust belt tension
Excessive Airflow	Blower speed to high	Reduce fan RPM
	Duct static pressure lower than design	Reduce fan RPM
Excessive Vibration and Noise	Misaligned pulleys	Align pulleys
	Damaged or unbalanced wheel	Replace wheel
	Fan is operating in the unstable region of the fan curve	Refer to performance curve for fan
	Bearings need lubrication or replacement	Lubricate or replace
	Fan speed is too high	Reduce fan RPM
	Belts too loose, worn or oily	Inspect and replace if needed

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance.

Please record any maintenance or service performed on this fan in the documentation section located at the end of this manual.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. The type of grease and the amount of grease can is shown below. **Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.**
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.

Bearing Grease Charge

Ball Bearings	
Shaft Size (Inches)	**Grease Charge (Ounces)**
1/2 to 3/4	0.03
7/8 to 1 3/16	0.10
1 1/4 to 1 1/2	0.15
1 11/16 to 1 15/16	0.20
2 to 2 7/16	0.30
2 1/2 to 2 15/16	0.50
3 to 3 7/16	0.85
3 1/2 to 4	1.50

Bearing Grease Type

Thickener	Lithium Complex
Oil	Petroleum
Thickness	NLGI 2
Operating Temperature	-20 F to 200 F Intermittent to 250 F

2 weeks after startup

1. Belt tension should be checked after the first 2 weeks of fan operation on belt drive fans. Belts tend to stretch and settle into pulleys after an initial start-up sequence. **Do not tension belts by changing the setting of the motor pulley**, this will change the fan speed and may damage the motor. To re-tension belts, turn the power to the fan motor OFF. Loosen the fasteners that hold the motor to the fan. Move the motor to the left or right to adjust the belt tension. Belt tension should be adjusted to allow 1/64" of deflection per inch of belt span. Exercise extreme care when adjusting V-belts as not to misalign pulleys. Any misalignment will cause a sharp reduction in belt life and produce squeaky noises. Over-tightening will cause excessive belt and bearing wear as well as noise. Too little tension will cause slippage at startup and uneven wear. **Whenever belts are removed or installed, never force belts over pulleys without loosening motor first to relieve belt tension.** When replacing belts, use the same type as supplied by the manufacturer. On units shipped with double groove pulleys, matched belts should always be used.
2. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.

Every 3 months

1. Belt tension should be checked quarterly for belt drive fans. See instructions in the previous maintenance section. Over-tightening will cause excessive bearing wear and noise. Too little tension will cause slippage at startup and uneven wear.
2. Fans need to be cleaned quarterly, and more often in severe conditions.

Yearly

1. Inspect bearings for wear and deterioration. Replace/grease if necessary.
2. Inspect belt wear and replace torn or worn belts on belt drive fans.
3. Inspect bolts and set screws for tightness. Tighten as necessary.
4. Inspect motor for cleanliness. Clean exterior surfaces only. Remove dust and grease from the motor housing to ensure proper motor cooling. Remove dirt and grease from the wheel and housing to prevent imbalance and damage.

Start-Up and Maintenance Documentation

START-UP AND MEASUREMENTS SHOULD BE PERFORMED AFTER THE SYSTEM HAS BEEN AIR BALANCED (Warranty will be void without completion of this form)

Job Information

Job Name	
Address	
City	
State	
Zip	
Phone Number	
Fax Number	
Contact	
Purchase Date	

Service Company	
Address	
City	
State	
Zip	
Phone Number	
Fax Number	
Contact	
Start-Up Date	

Fan Unit Information

Refer to the start-up procedure in this manual to complete this section.

Name Plate and Unit Information	
Model Number	
Serial Number	
Volts	
Hertz	
Phase	
FLA	
HP	
Blower Pulley	
Motor Pulley	
Belt Number	

Field Measured Information	
Voltage	
Amperage**	
RPM	

Blower Rotation	Correct	
	Incorrect	

**If measured amps exceed the FLA rating on the nameplate, fan RPM must be reduced to decrease the measured amps below the nameplate FLA rating.

Maintenance Record

Date	Service Performed

Factory Service Department

Phone: 1-866-784-6900
Fax: 1-919-554-9374

Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

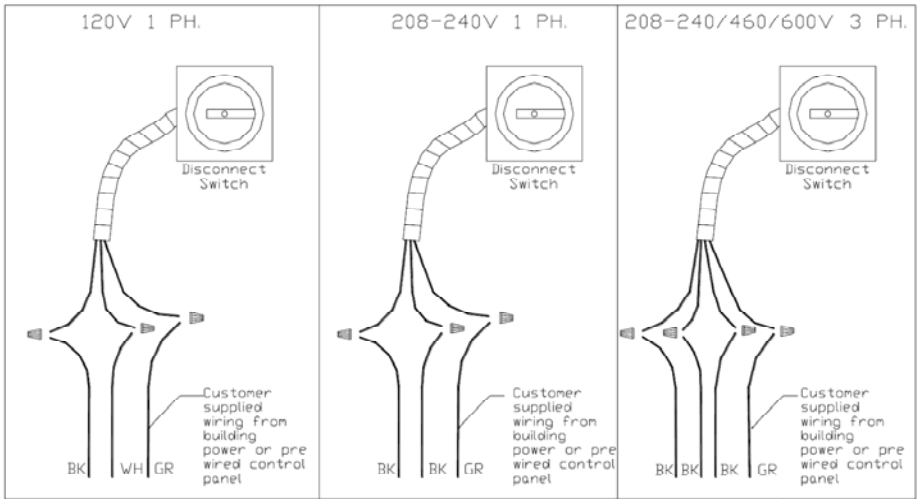
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

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2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
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LEESON

F8

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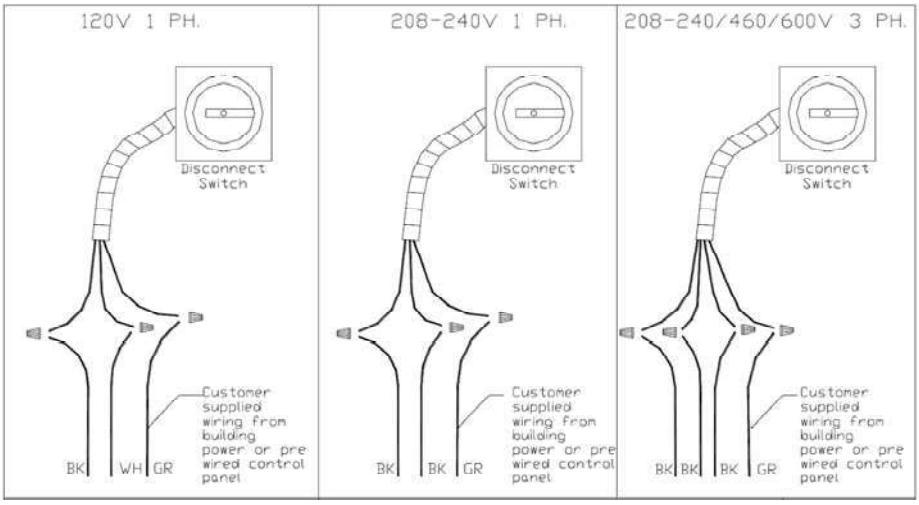

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Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
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MAINTENANCE

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LEESON

PRODUCT INFORMATION PACKET

Model No: A4P17NR1H

Catalog No: 100803.00

1/4HP..1625RPM.48.TENV.115/230V.1PH.60HZ.AIROVER.AUTOMATIC.40C.1.0SF.RESILIENT BASE.AG - FAN & BLOWER.A4P17NR1H

Agricultural

Product Information Packet: Model No: A4P17NR1H, Catalog No:100803.00 1/4HP..1625RPM.48.TENV.115/230V.1PH.60HZ.AIROVER.AUTOMATIC.40C.1.0SF.RESILIENT BASE.AG - FAN & BLOWER.A4P17NR1H

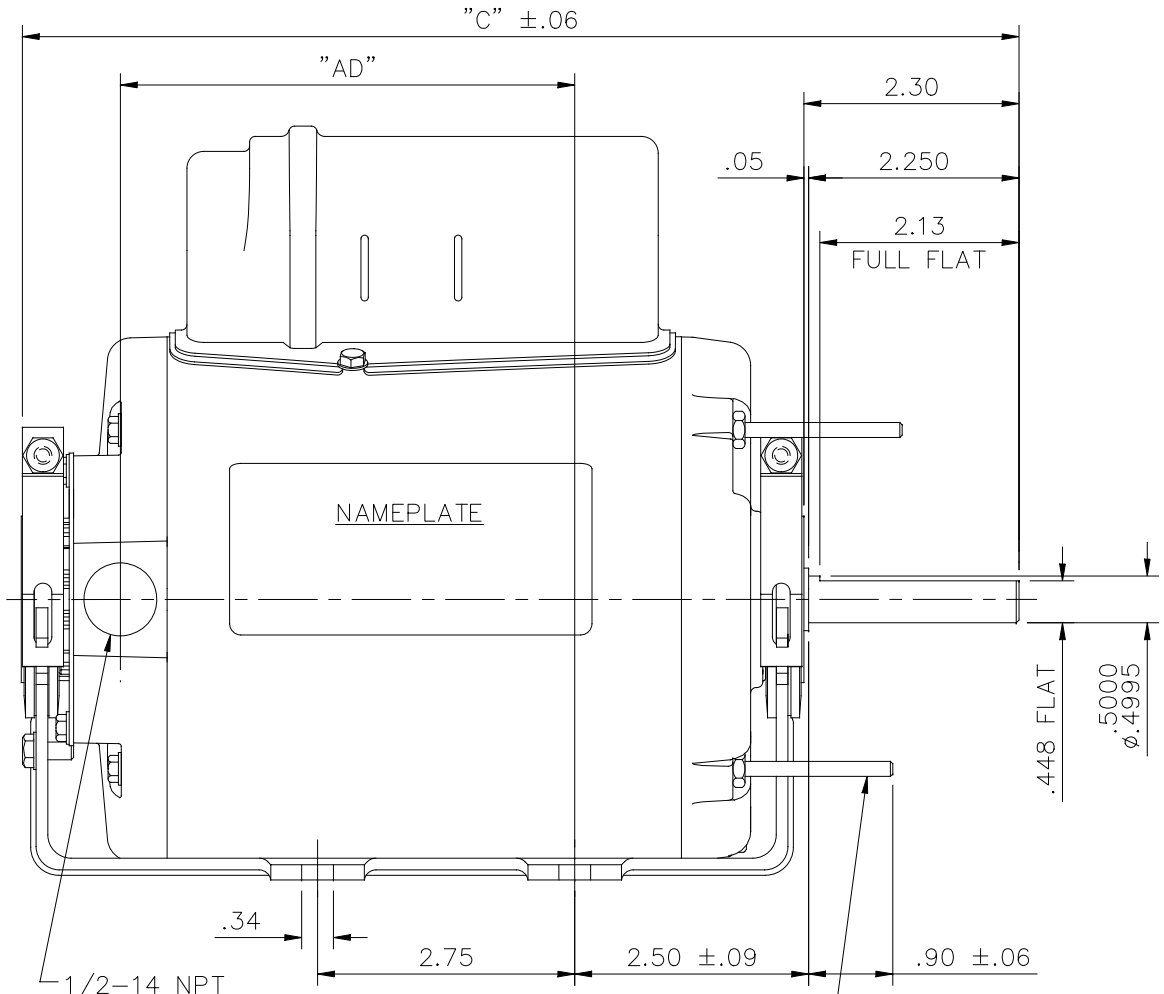
Nameplate Specifications

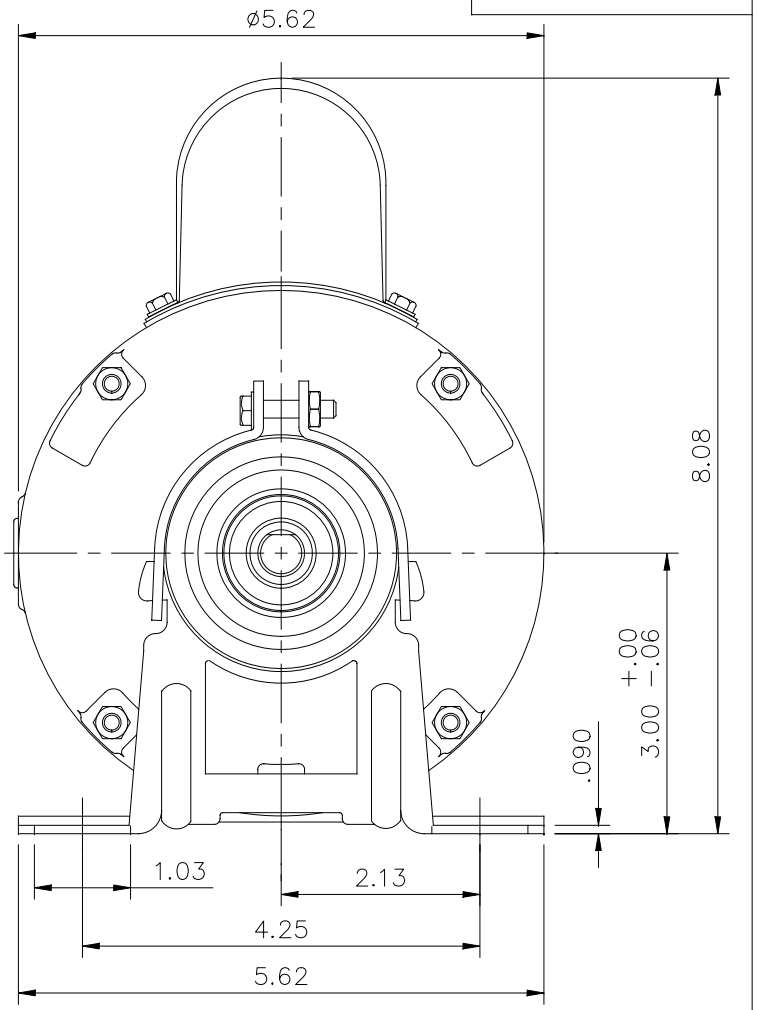
Output HP	**0.25 Hp**	Output KW	**0.19 kW**
Frequency	**60 Hz**	Voltage	**115/230 V**
Current	**2.8/1.4 A**	Speed	**1625 rpm**
Service Factor	**1**	Phase	**1**
Efficiency	**70 %**	Duty	**Continuous**
Insulation Class	**B**	Design Code	**NO DESIGN CODE**
KVA Code	**D**	Frame	**48**
Enclosure	**Totally Enclosed Non Ventilated**	Overload Protector	**Automatic**
Ambient Temperature	**40 °C**	Drive End Bearing Size	**6203**
Opp Drive End Bearing Size	**6203**	UL	**Recognized**
CSA	**Y**	CE	**N**
IP Code	**43**		

Technical Specifications

Electrical Type	**Permanent Split Capacitor**	Starting Method	**Across The Line**
Poles	**4**	Rotation	**Selective Counterclockwise**
Mounting	**Resilient Base**	Motor Orientation	**HORIZONTAL**
Drive End Bearing	**BALL**	Opp Drive End Bearing	**BALL**
Frame Material	**Rolled Steel**	Shaft Type	**T**
Overall Length	**10.66 in**	Frame Length	**5.50 in**
Shaft Diameter	**0.500 in**	Shaft Extension	**2.25 in**
Assembly/Box Mounting	**F1 ONLY**		
Outline Drawing	**031705-550**	Connection Diagram	**005109.15**

031705





DASH NO.	"C"	"AD"
550	10.66	4.86
600	11.16	5.36
650	11.66	5.86
700	12.16	6.36

GASKETS THROUGHOUT

NO.	REVISION	BY & DATE	CHK
01	RESILENT SCREW REVERSED AS PER ECO–0102363	KK 5/17/16	KK

TOLERANCES UNLESS SPECIFIED

DEC.	INCHES
.X	±.1
.XX	±.03
.XXX	±.005
.XXXX	±.0005
ANG	±1/2°

LEESON ELECTRIC MOTORS GEARMOTORS AND DRIVES

TITLE: OUTLINE – 48Z FRAME RESILIENT MOUNT – ENCLOSED

MAT'L.

FINISH

RFP

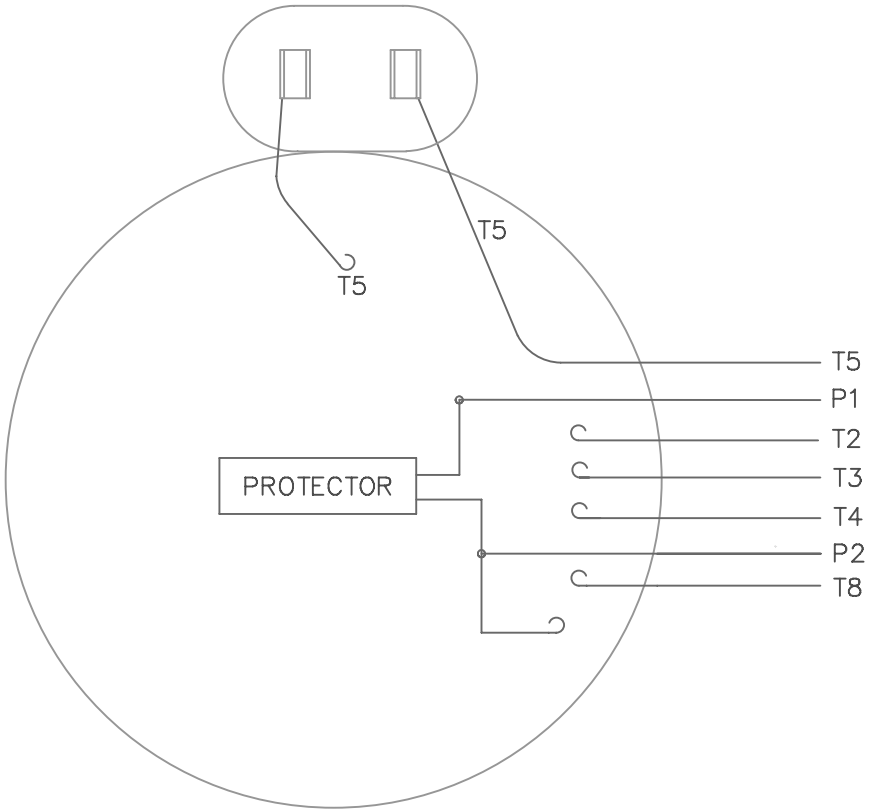
DIST

CAD FILE 031705

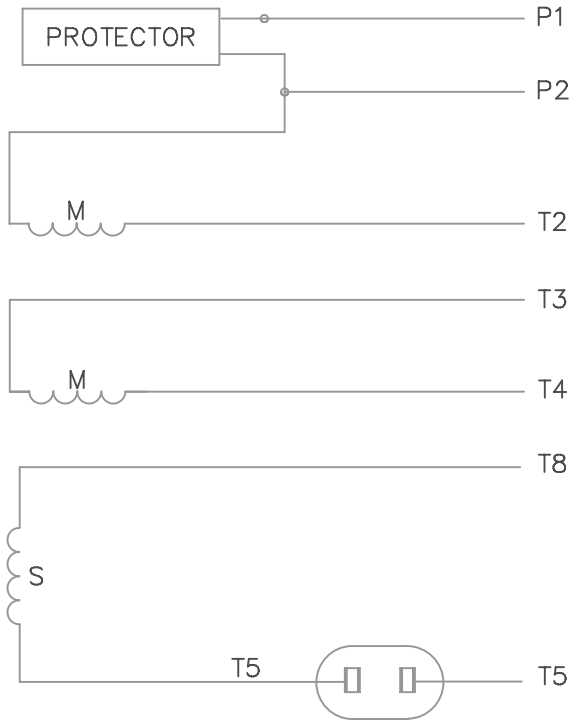
DRAWN	PG 7/24/02
CHK	
APPD	
SCALE	1=2
REF	031079
FMF	100804.00
PREV	

SIZE	DRAWING NO.	REV.
A	031705	01

VIEW FROM OUTSIDE OF MOTOR AT SWITCH END.



LINE LEADS



	ROTATION FACING LEAD END	L1	L2	JOIN	INSULATE SEPARATELY
HIGH VOLT	C.C.W.	P1	T4 T5	T2,T3 T8	P2
	C.W.	P1	T4 T8	T2,T3 T5	P2
LOW VOLT	C.C.W.	P1	T2,T4 T5	P2,T3 T8	--
	C.W.	P1	T2,T4 T8	P2,T3 T5	--

NO.	REVISION	BY & DATE	CHK

TOLERANCES UNLESS SPECIFIED	
DEC.	INCHES
.X	±.1
.XX	±.01
.XXX	±.005
.XXXX	±.0005
ANG	±1/2°

LEESON ELECTRIC MOTORS GEARMOTORS AND DRIVES

TITLE	EXTERNAL WIRING DIAGRAM TYPE "P" W/PROTECTOR
MAT'L.	DECAL – 004011
FINISH	
CAD FILE	00510915
RFP	
DIST	

DRAWN	PG 3/4/02
CHK	
APPD	
SCALE	1=1
REF	005109-01
FMF	102675
PREV	

SIZE	DRAWING NO.	REV.
A	005109-15	

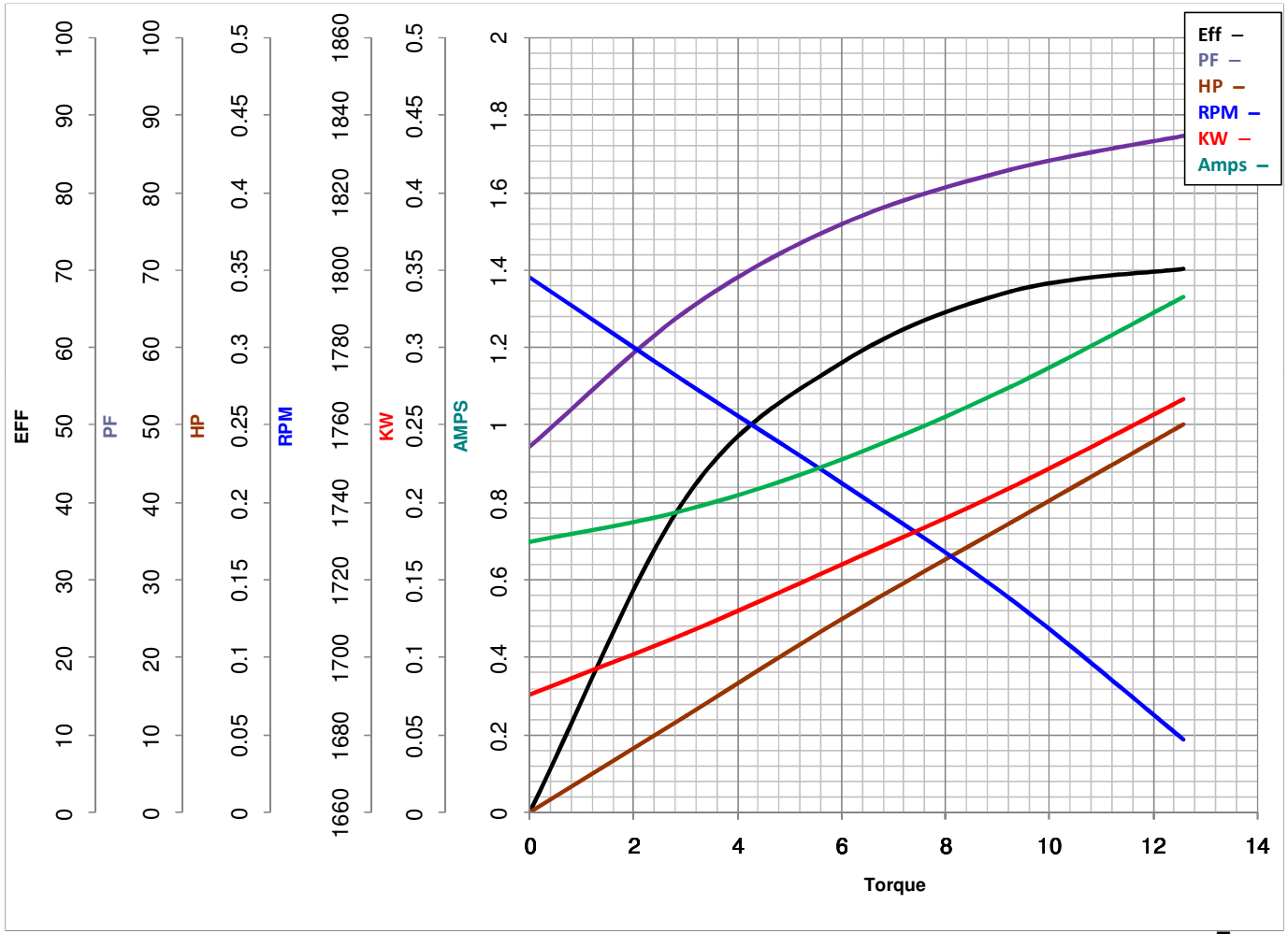
LEESON ELECTRIC CORPORATION

TYPICAL PERFORMANCE CURVE for AC MOTOR

Curve at 230 **Volts** **HP** 0.25 **PHASE** 1
60 **HZ**
0.25 **HP** **VOLTS** 115/230

Model No 100803.00

Catalog No 100803.00 **HZ** 60 **RPM** 1625



Torque in Oz.Ft

FL TORQUE	12.56	**Oz.Ft**	**FL AMPS**	2.8/1.4	
BD TORQUE	27.0	**Oz.Ft**	**PU TORQUE**	7.5	**Oz.Ft**
LR TORQUE	8	**Oz.Ft**	**LR AMPS**	5	
WINDING	PE484448-3			**Date**	**3/28/2018**

F8-F12

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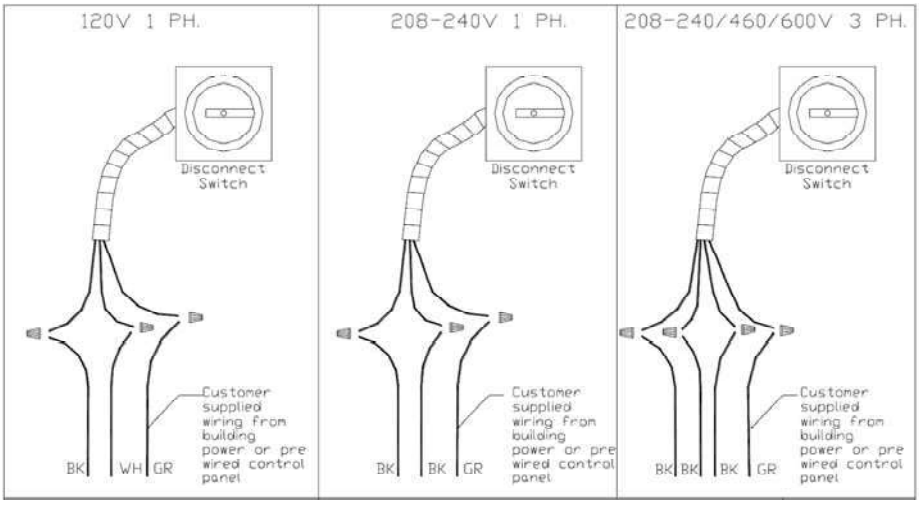
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

PRODUCT INFORMATION PACKET

Model No: A4P17NR2H

Catalog No: 100804.00

1/3HP..1625RPM.48.TENV.115/230V.1PH.60HZ.AIROVER.AUTOMATIC.40C.1.0SF.RESILIENT BASE.AG - FAN & BLOWER.A4P17NR2H

Agricultural

Product Information Packet: Model No: A4P17NR2H, Catalog No:100804.00 1/3HP..1625RPM.48.TENV.115/230V.1PH.60HZ.AIROVER.AUTOMATIC.40C.1.0SF.RESILIENT BASE.AG - FAN & BLOWER.A4P17NR2H

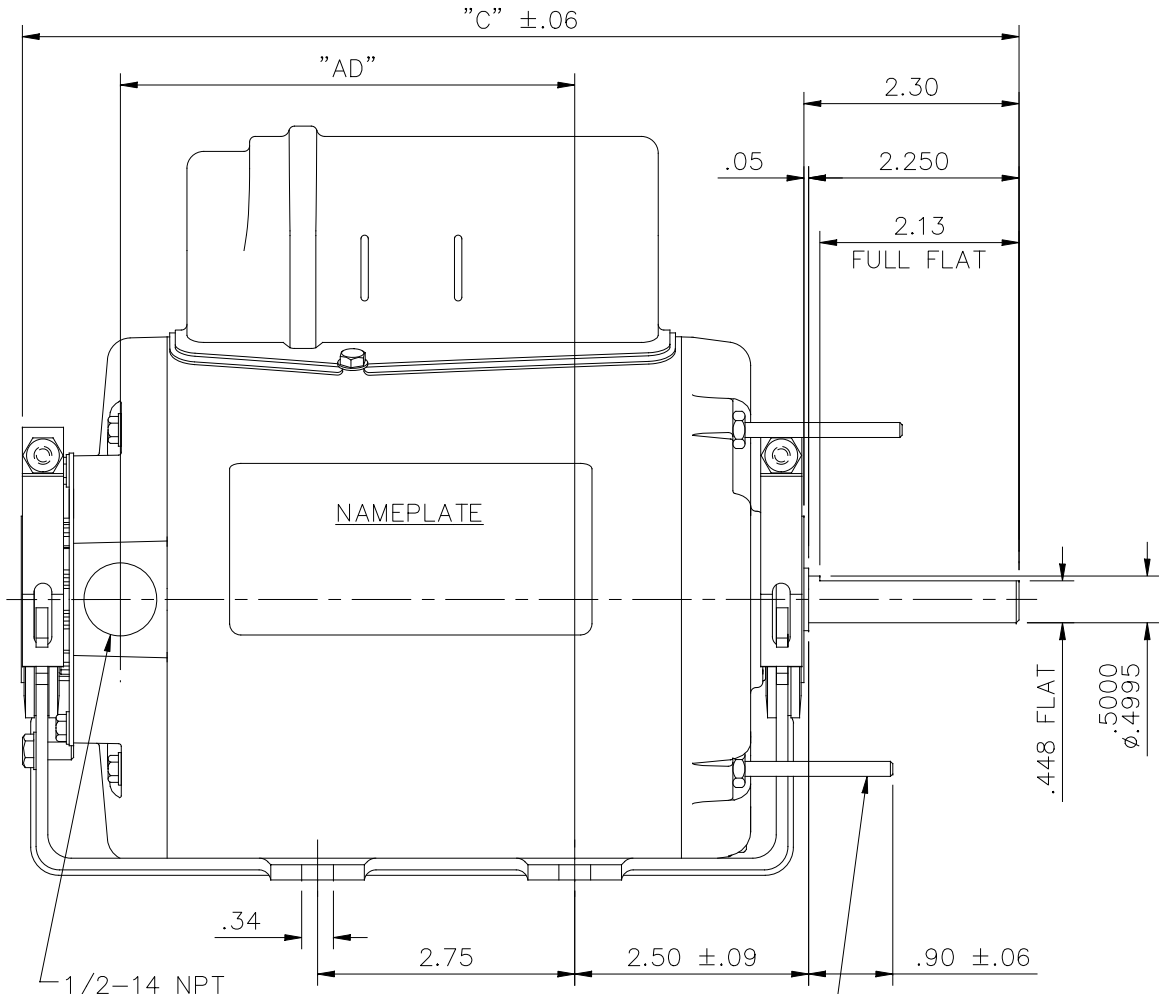
Nameplate Specifications

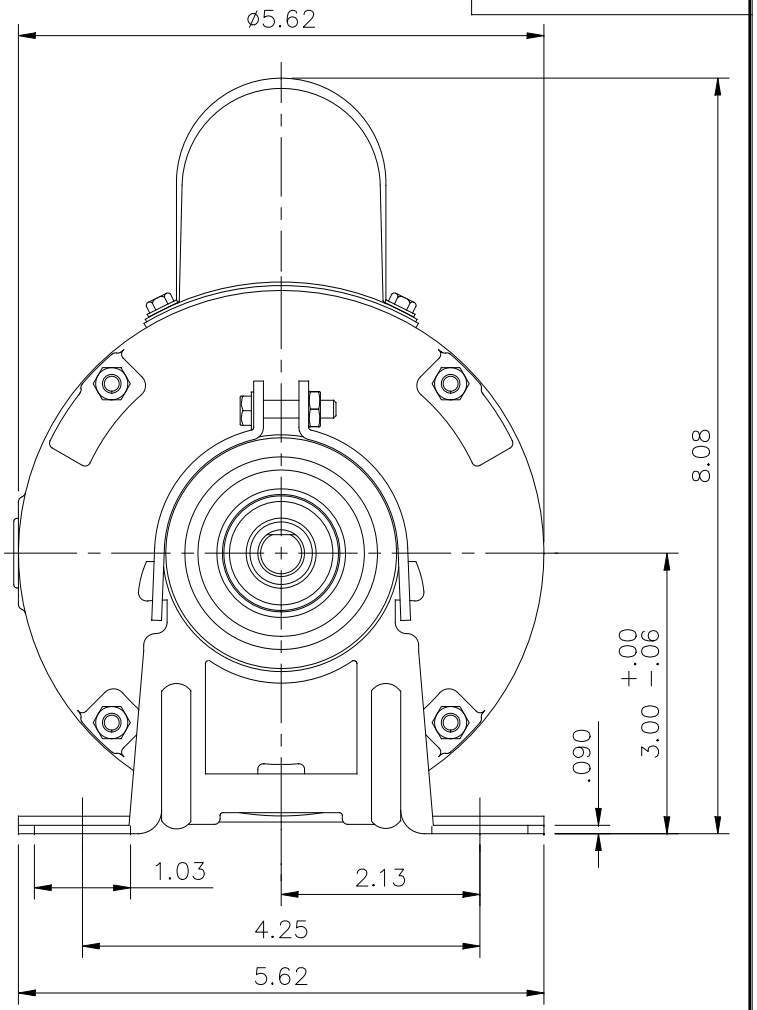
Output HP	**0.33 Hp**	Output KW	**0.25 kW**
Frequency	**60 Hz**	Voltage	**115/230 V**
Current	**3.2/1.6 A**	Speed	**1625 rpm**
Service Factor	**1**	Phase	**1**
Efficiency	**72 %**	Duty	**Continuous**
Insulation Class	**B**	Design Code	**NO DESIGN CODE**
KVA Code	**D**	Frame	**48**
Enclosure	**Totally Enclosed Non Ventilated**	Overload Protector	**Automatic**
Ambient Temperature	**40 °C**	Drive End Bearing Size	**6203**
Opp Drive End Bearing Size	**6203**	UL	**Recognized**
CSA	**Y**	CE	**N**
IP Code	**43**		

Technical Specifications

Electrical Type	**Permanent Split Capacitor**	Starting Method	**Across The Line**
Poles	**4**	Rotation	**Selective Counterclockwise**
Mounting	**Resilient Base**	Motor Orientation	**HORIZONTAL**
Drive End Bearing	**BALL**	Opp Drive End Bearing	**BALL**
Frame Material	**Rolled Steel**	Shaft Type	**T**
Overall Length	**10.66 in**	Frame Length	**5.50 in**
Shaft Diameter	**0.500 in**	Shaft Extension	**2.25 in**
Assembly/Box Mounting	**F1 ONLY**		
Outline Drawing	**031705-550**	Connection Diagram	**005109.15**

031705





DASH NO.	"C"	"AD"
550	10.66	4.86
600	11.16	5.36
650	11.66	5.86
700	12.16	6.36

GASKETS THROUGHOUT

NO.	REVISION	BY & DATE	CHK
01	RESILENT SCREW REVERSED AS PER ECO–0102363	KK 5/17/16	KK

TOLERANCES UNLESS SPECIFIED	
DEC.	INCHES
.X	±.1
.XX	±.03
.XXX	±.005
.XXXX	±.0005
ANG	±1/2°

LEESON ELECTRIC MOTORS GEARMOTORS AND DRIVES

TITLE: OUTLINE – 48Z FRAME RESILIENT MOUNT – ENCLOSED

DRAWN	PG 7/24/02
CHK	
APPD	
SCALE	1=2
REF	031079
FMF	100804.00
PREV	

MAT'L.

FINISH

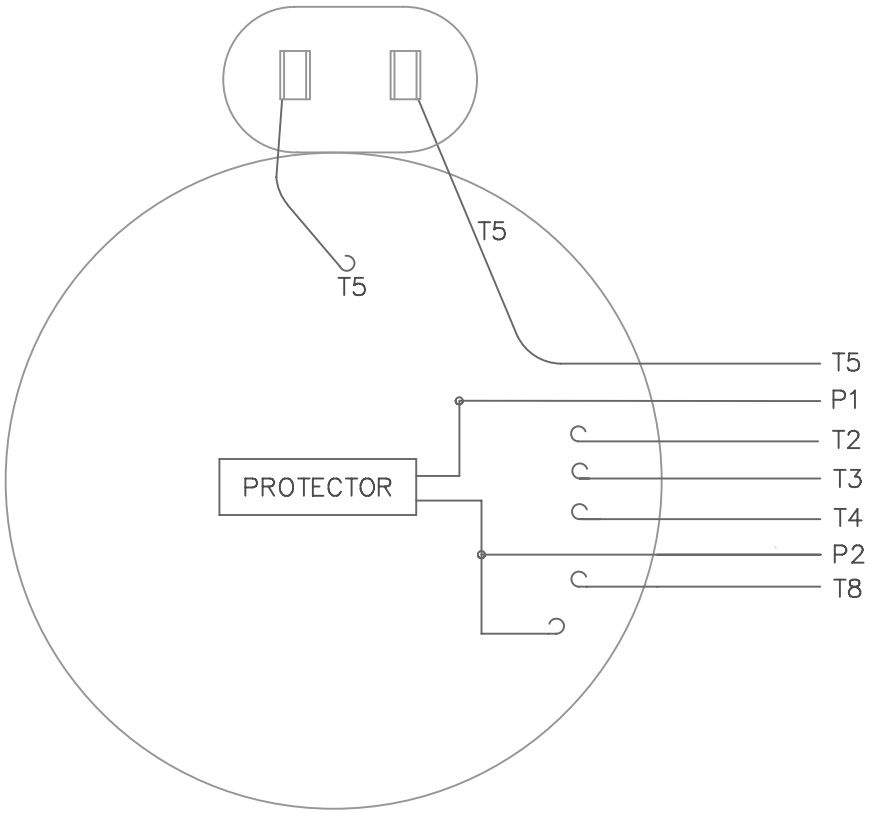
RFP

DIST

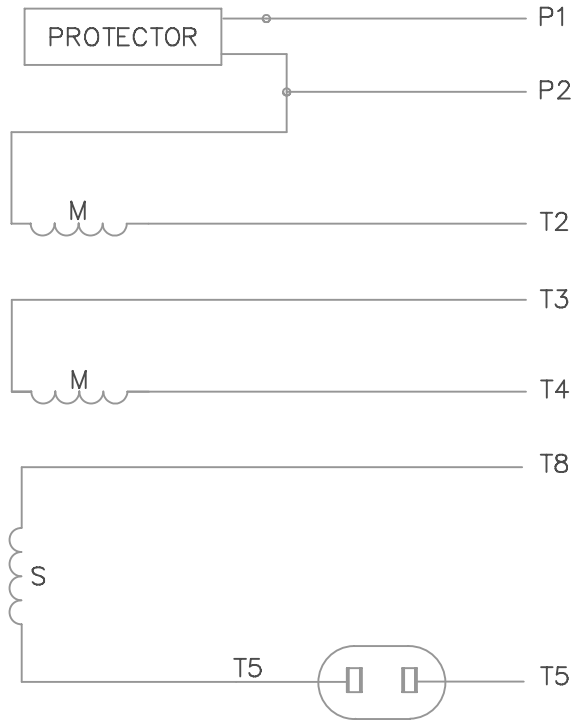
CAD FILE 031705

SIZE	DRAWING NO.	REV.
A	031705	01

VIEW FROM OUTSIDE OF MOTOR AT SWITCH END.



LINE LEADS



	ROTATION FACING LEAD END	L1	L2	JOIN	INSULATE SEPARATELY
HIGH VOLT	C.C.W.	P1	T4 T5	T2,T3 T8	P2
	C.W.	P1	T4 T8	T2,T3 T5	P2
LOW VOLT	C.C.W.	P1	T2,T4 T5	P2,T3 T8	--
	C.W.	P1	T2,T4 T8	P2,T3 T5	--

NO.	REVISION	BY & DATE	CHK

TOLERANCES UNLESS SPECIFIED

DEC.	INCHES
.X	±.1
.XX	±.01
.XXX	±.005
.XXXX	±.0005
ANG	±1/2°

LEESON ELECTRIC MOTORS GEARMOTORS AND DRIVES

TITLE: EXTERNAL WIRING DIAGRAM TYPE "P" W/PROTECTOR

MAT'L.: DECAL – 004011

FINISH:

CAD FILE: 00510915

RFP:

DIST:

DRAWN	PG 3/4/02
CHK	
APPD	
SCALE	1=1
REF	005109-01
FMF	102675
PREV	

SIZE: A

DRAWING NO.: 005109-15

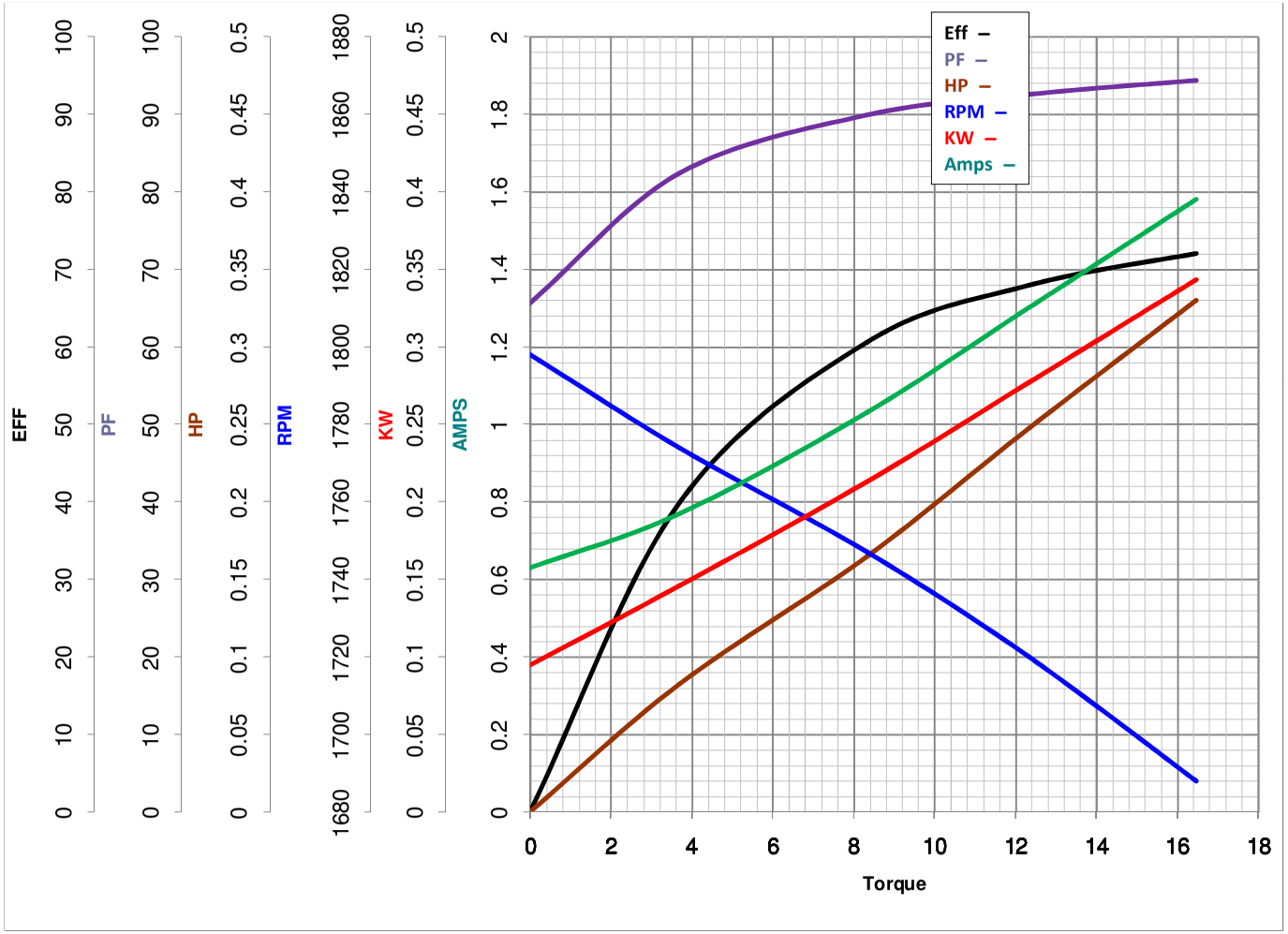
REV.:

9/25/2008 5:20:27 PM

LEESON ELECTRIC CORPORATION

TYPICAL PERFORMANCE CURVE for AC MOTOR

Curve at	230	**Volts**	**HP**	0.34	**PHASE**	1
	60	**HZ**				
Model No 100804.00	0.33	**HP**	**VOLTS**	115/230		
Catalog No 100804.00			**HZ**	60	**RPM**	1625



Torque in Oz.Ft

FL TORQUE	16.48	**Oz.Ft**	**FL AMPS**	3.2/1.6	
BD TORQUE	34.0	**Oz.Ft**	**PU TORQUE**	9.0	**Oz.Ft**
LR TORQUE	10	**Oz.Ft**	**LR AMPS**	6	
WINDING	PE484446-3			**Date**	3/13/2018

G10

Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

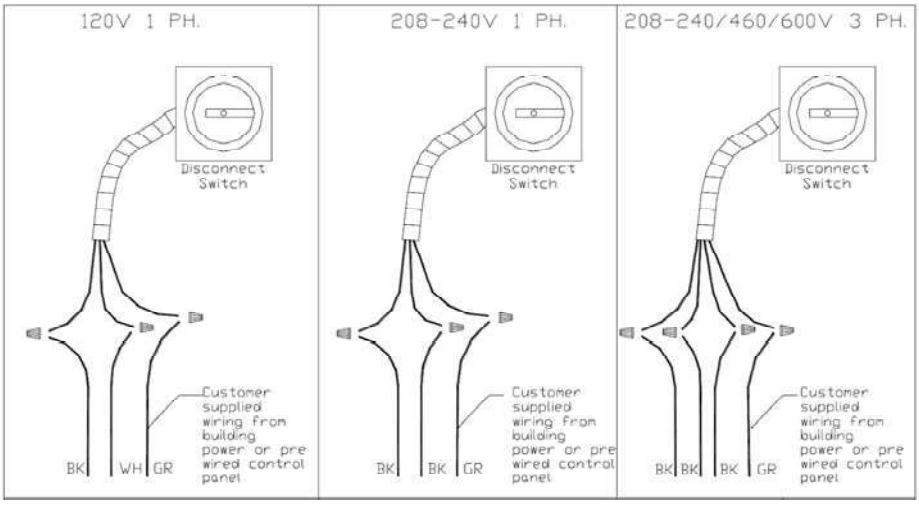
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
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7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

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Problem Potential Cause Corrective Action

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Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
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	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12895578
		Catalog # :	.5018ES3E56C-S

Frame	: 56C	Locked rotor time	: 36s (cold) 20s (hot)
Output	: 0.5 HP (0.37 kW)	Temperature rise	: 80 K
Poles	: 4	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 208-230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 1.91-1.72/0.862 A	Protection degree	: IP55
L. R. Amperes	: 13.3-12.1/6.03 A	Cooling method	: IC411 - TEFC
LRC	: 7.0x(Code L)	Mounting	: F-1
No load current	: 1.03-1.20/0.600 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1760 rpm	Noise level[2]	: 52.0 dB(A)
Slip	: 2.22 %	Starting method	: Direct On Line
Rated torque	: 0.206 kgfm	Approx. weight[3]	: 9.9 kg
Locked rotor torque	: 240 %		
Breakdown torque	: 300 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 0.0025 kgm²		

Output	25%	50%	75%	100%
Efficiency (%)	65.4	68.0	74.0	77.0
Power Factor	0.28	0.48	0.61	0.70

Foundation loads	
Max. traction	: 18 kgf
Max. compression	: 28 kgf

		Drive end	Non drive end
Bearing type	:	6203 ZZ	6202 ZZ
Sealing	:	V'Ring	Without Bearing Seal
Lubrication interval	:	-	-
Lubricant amount	:	-	-
Lubricant type	:	Mobil Polyrex EM	

Notes
USABLE @208V SF 1.00

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

Rev.	Changes Summary	Performed	Checked	Date

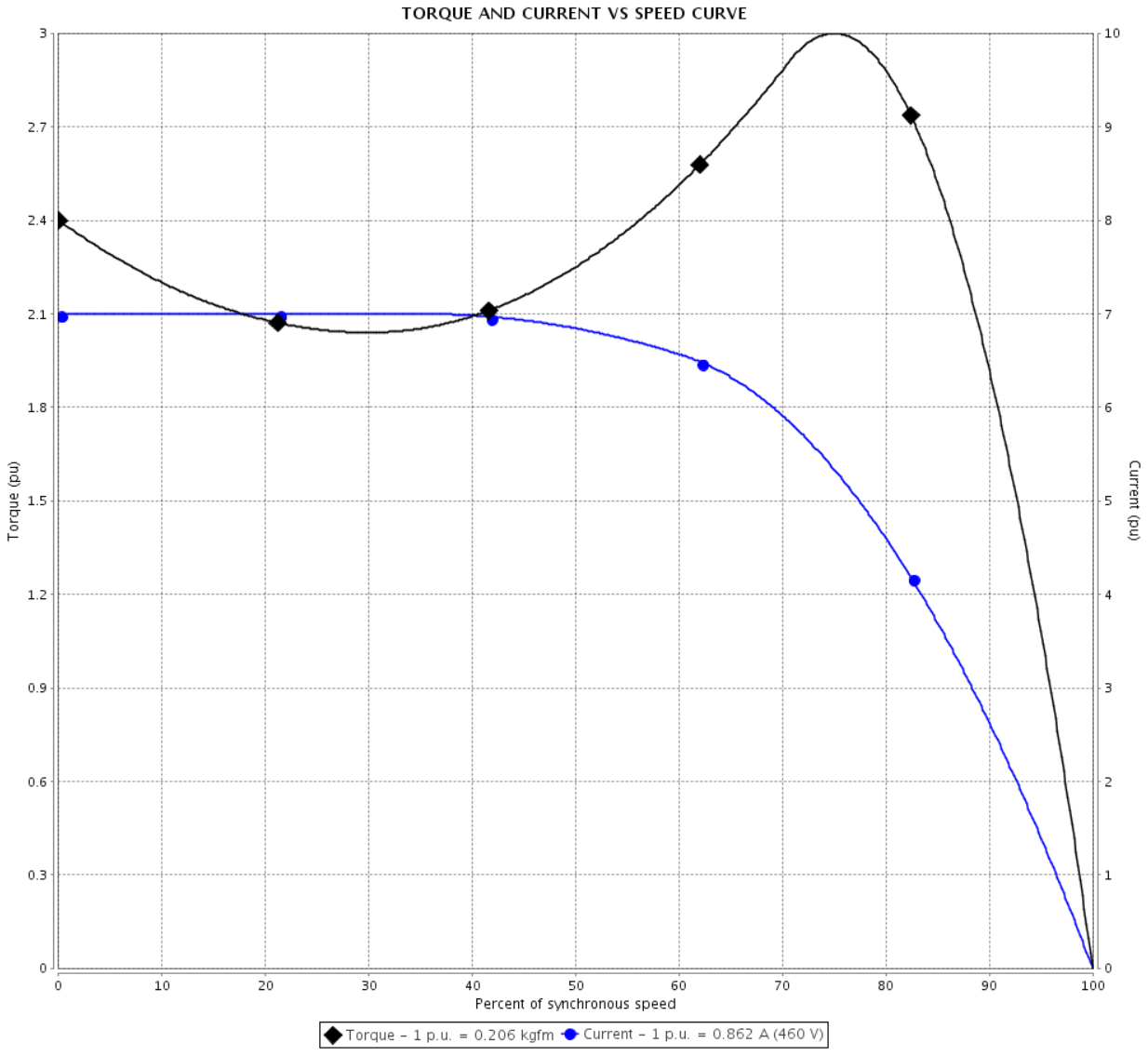
Performed by				
Checked by			Page	Revision
Date	13/04/2021		1 / 5	

TORQUE AND CURRENT VS SPEED CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12895578
		Catalog # :	.5018ES3E56C-S



Performance	: 208-230/460 V 60 Hz 4P

Rated current	: 1.91-1.72/0.862 A	Moment of inertia (J)	: 0.0025 kgm²
LRC	: 7.0	Duty cycle	: Cont.(S1)
Rated torque	: 0.206 kgfm	Insulation class	: F
Locked rotor torque	: 240 %	Service factor	:
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1760 rpm		

Locked rotor time	: 36s (cold) 20s (hot)

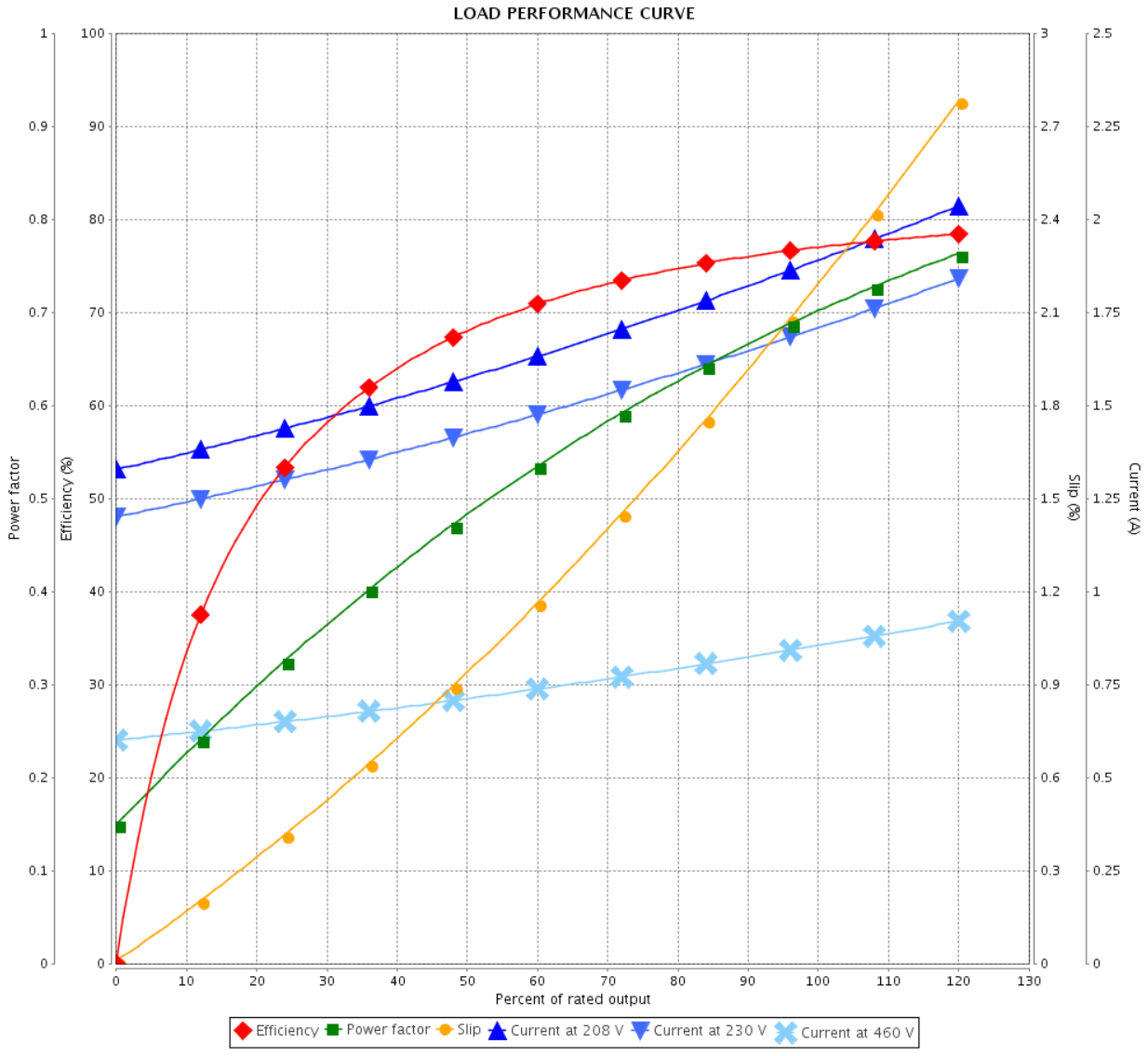
Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	13/04/2021		2 / 5	

LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:		
Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12895578
		Catalog # :	.5018ES3E56C-S



Performance	: 208-230/460 V 60 Hz 4P		
Rated current	: 1.91-1.72/0.862 A	Moment of inertia (J)	: 0.0025 kgm²
LRC	: 7.0	Duty cycle	: Cont.(S1)
Rated torque	: 0.206 kgfm	Insulation class	: F
Locked rotor torque	: 240 %	Service factor	:
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1760 rpm		

Rev.	Changes Summary	Performed	Checked	Date

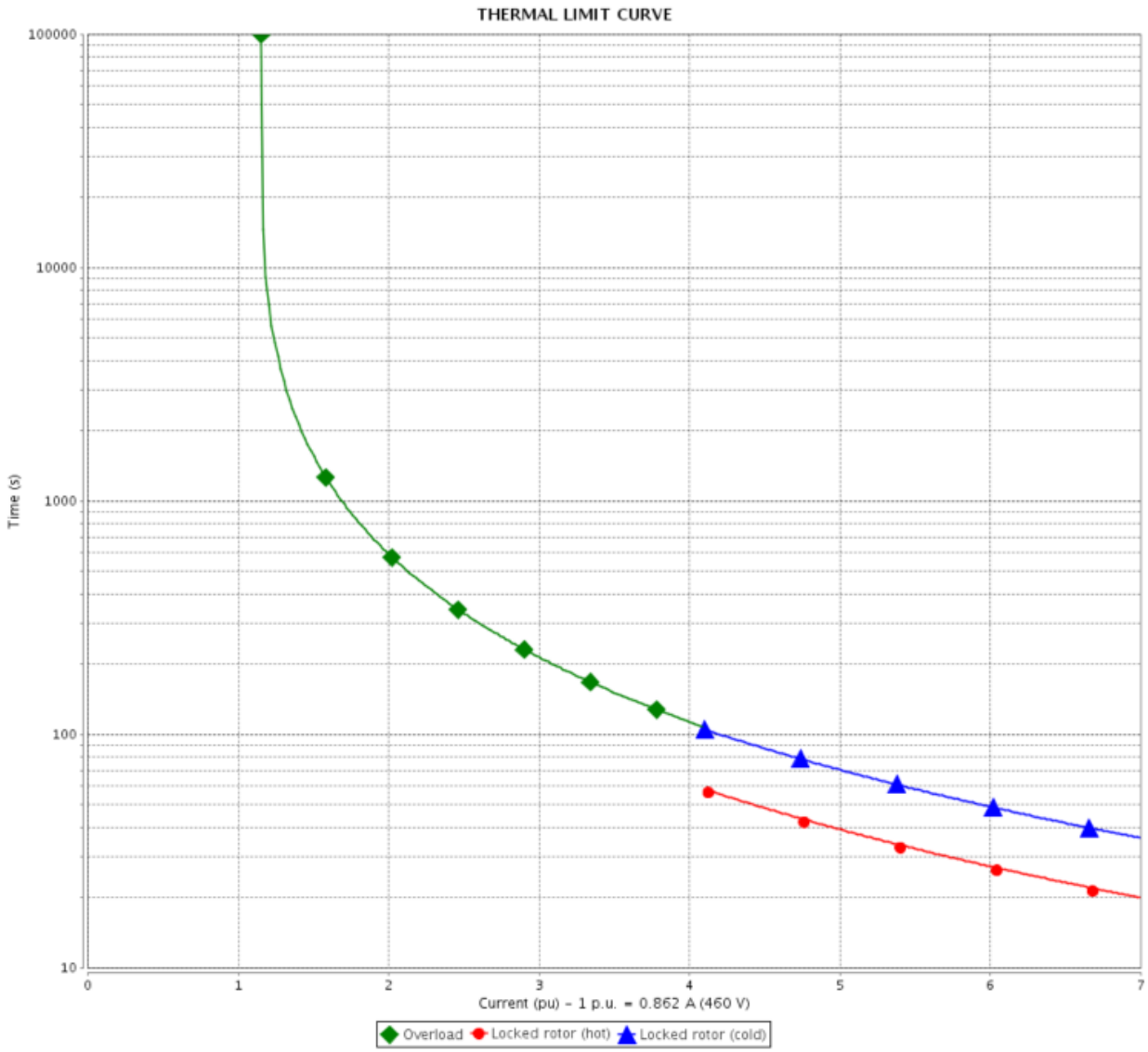
Performed by				
Checked by			Page	Revision
Date	13/04/2021		3 / 5	

THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12895578
		Catalog # :	.5018ES3E56C-S



Performance	: 208-230/460 V 60 Hz 4P

Rated current	: 1.91-1.72/0.862 A	Moment of inertia (J)	: 0.0025 kgm²
LRC	: 7.0	Duty cycle	: Cont.(S1)
Rated torque	: 0.206 kgfm	Insulation class	: F
Locked rotor torque	: 240 %	Service factor	:
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1760 rpm		

Heating constant	
Cooling constant	

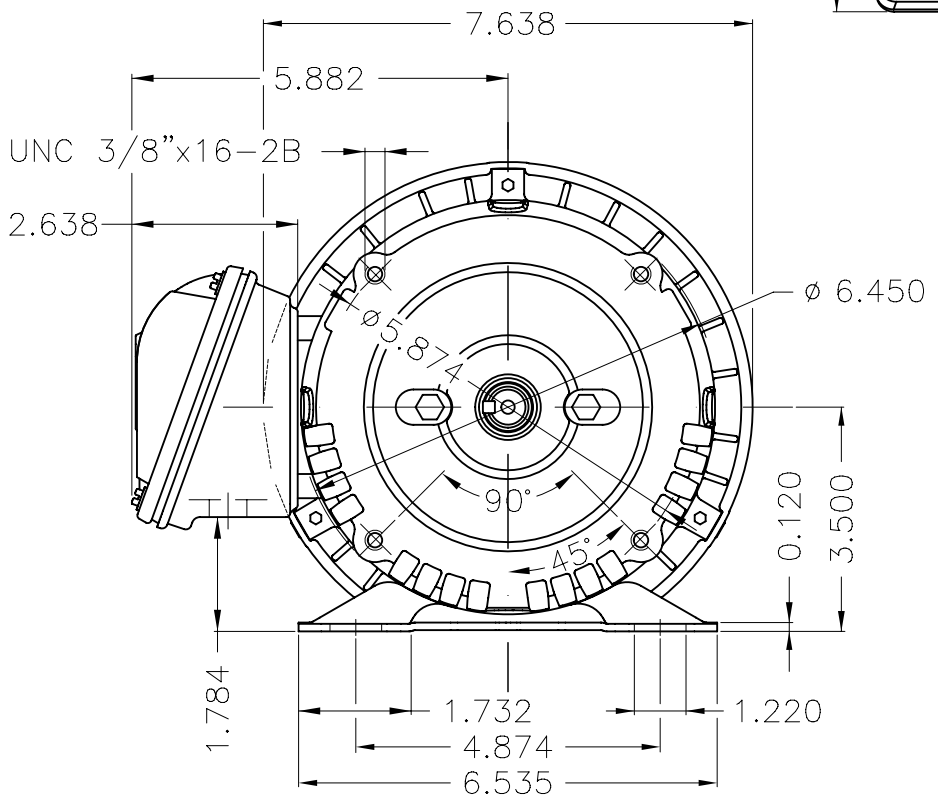
Rev.	Changes Summary	Performed	Checked	Date

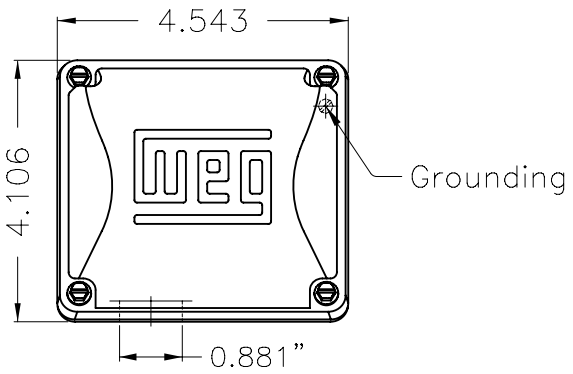
Performed by				
Checked by			Page	Revision
Date	13/04/2021		4 / 5	

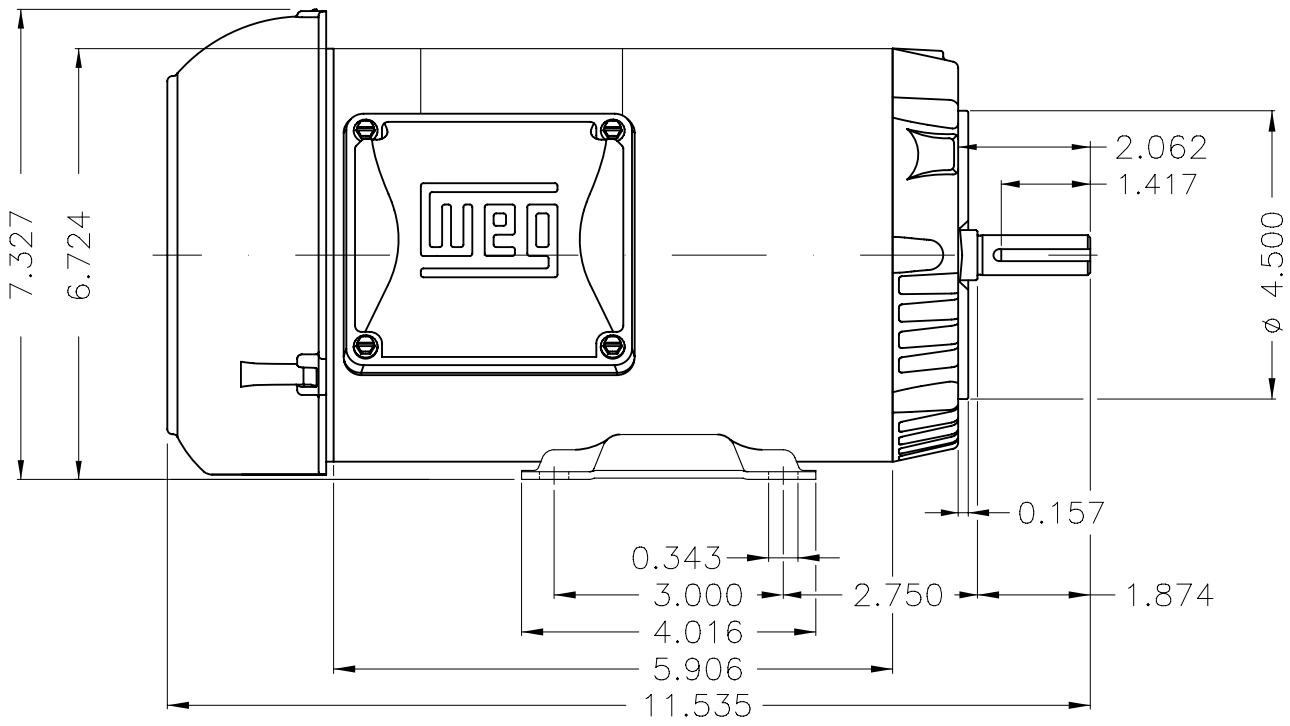
EIXO
PADRÃO X
OPCIONAL
ESPECIAL

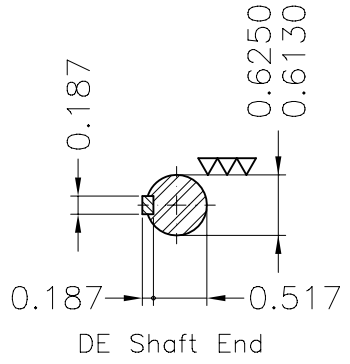
Dimensões em polegada
Dimensions in inches

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.









Color Munsell N 1 matte black
Painting plan 207N
Mounting F-1/B34R(D)

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER
EXECUTED	USERADMIN	THREE PHASE MOTOR CLOSED ROLLED STEEL					
CHECKED		FRAME 56C IP55 TEFC					
RELEASED		WEG code: 12895578					
REL DT	13.04.2021	WMO Jaragua do Sul Product Engineering	SHEET 1 / 1				

0.5 HP 04 Poles 60Hz

A

ZME A3

3PT9

C UL US LISTED FOR SAFE AREA

C SA US

MADE IN BRAZIL

MAT: 12895578

W01.TE0IC0X0X

For 60Hz: Class I, Zone 2, IIC
Class I, Div.2, Gr. A,B,C,D - T3
Div 2 Inverter Duty (SF1.00)
CT 2:1/VT 1000:1

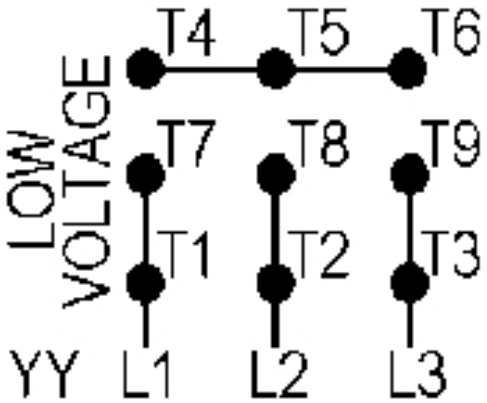
06MAR2021 B/N:

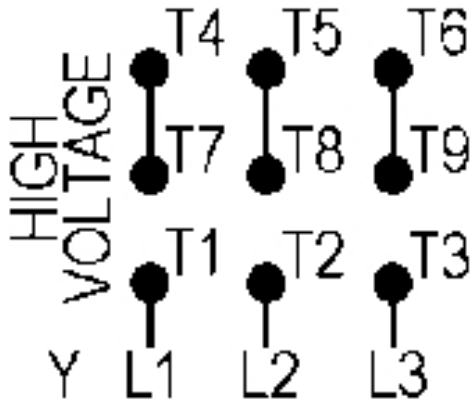
PH 3	Hz 60	HP 0.50	
FR 56C		kW 0.37	
DUTY CONT.		V 208-230/460	
ALT 1000 m.a.s.l		A 1.91-1.72/0.862	
INS CL F ΔT 80K	IP55	SFA 1.91-1.98/0.991	
AMB 40°C	DES -	SF 1.15	
ENCL TEFC	CODE L	PF 0.70	
USABLE @ 208V SF1.00		RPM 1760	
		NEMA NOM. EFF 77.0%	

ALTERNATE RATING: 0.50HP 50Hz 190-220/380-415V SF1.15
1.90-1.81/0.950-0.962A 1445RPM EFF 75.4% (IE2) IEC 60034-1

For safe area-Inverter duty motor For 60Hz use on VPWM 1000:1 VT, 10:1 CT

DE 6203-ZZ	ODE 6202-ZZ	MOBIL POLYREX EM	





T1-BLU T2-WHT
T3-ORG T4-YEL
T5-BLK T6-GRY
T7-PNK T8-RED
T9-BRK RED

INTERCHANGE ANY TWO LINE WIRES TO REVERSE THE ROTATION

WARNING: Motor must be grounded in accordance with local and national electrical codes to prevent serious electrical shocks. Disconnect power source before servicing unit.

AVERTISSEMENT: Le moteur doit être mis à la terre conformément aux codes électriques locaux et nationaux afin d'éviter tout choc électrique grave. Déconnectez l'alimentation avant l'entretien de la machine.

G10-XP
Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

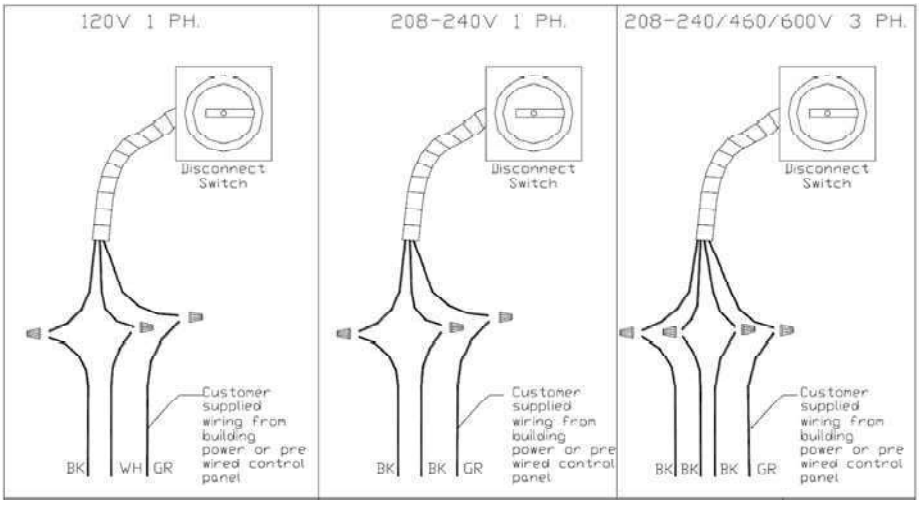
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

Dealers Industrial Equipment

No.:

Date: 12-SEP-2016

DATA SHEET
Three-phase induction motor - Squirrel cage rotor

Customer	:
Product line	: Three-Phase: Fractional Explosion Proof Motors

Frame	: 56
Output	: 0.5 HP
Frequency	: 60 Hz
Poles	: 4
Full load speed	: 1725 rpm
Slip	: 4.17 %
Voltage	: 208-230/460 V
Rated current	: 1.77-1.60/0.802 A
Locked rotor current	: 10.6/5.29 A
Locked rotor current (Il/In)	: 6.6
No-load current	: 1.20/0.600 A
Full load torque	: 1.50 lb.ft
Locked rotor torque	: 290 %
Breakdown torque	: 400 %
Design	: A
Insulation class	: F
Temperature rise	: 80 K
Locked rotor time	: 13 s (hot)
Service factor	: 1.00
Duty cycle	: S1
Ambient temperature	: -20°C - +50°C
Altitude	: 1000 m
Degree of Protection	: IP55
Approximate weight	: 24 lb
Moment of inertia	: 0.01709 sq.ft.lb
Noise level	: ---

	D.E.	N.D.E.
Bearings	6203 ZZ	6203 ZZ
Regreasing interval	---	---
Grease amount	---	---

Load	Power factor	Efficiency (%)
100%	0.75	77.2
75%	0.67	75.0
50%	0.55	69.0

Notes:

Generated for Model #.5018XS3E56C

Performed by	Checked

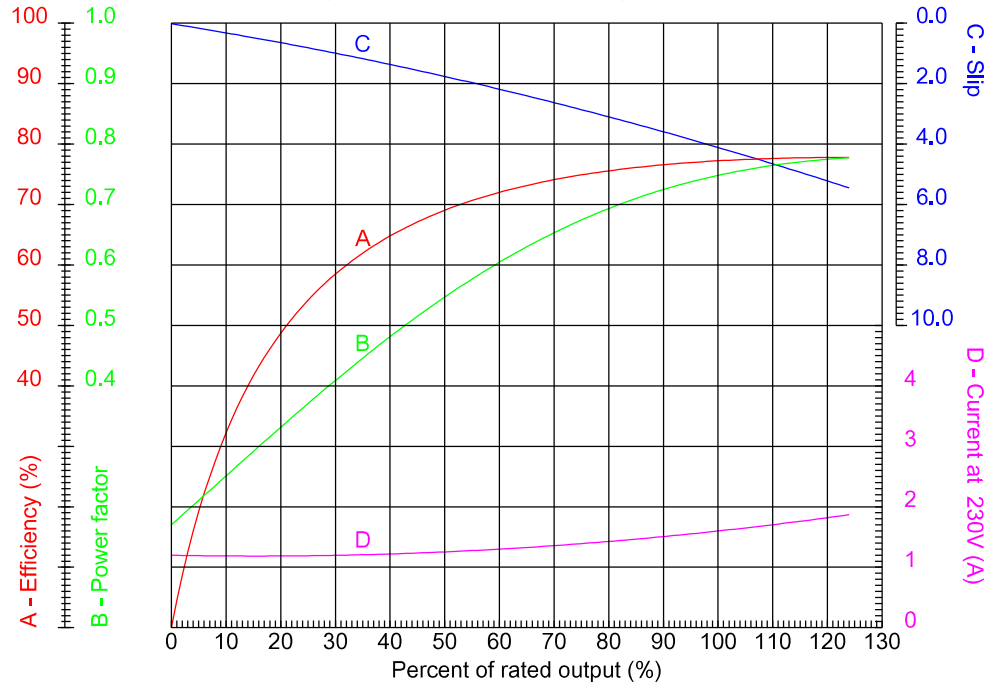
Dealers Industrial Equipment

No.:

Date: 12-SEP-2016

PERFORMANCE CURVES RELATED TO RATED OUTPUT

Three-phase induction motor - Squirrel cage rotor



Customer	:		
Product line	:	Three-Phase: Fractional Explosion Proof Motors	

Frame	: 56	Locked rotor current (Il/In)	: 6.6
Output	: 0.5 HP	Duty cycle	: S1
Frequency	: 60 Hz	Service factor	: 1.00
Full load speed	: 1725 rpm	Design	: A
Voltage	: 208-230/460 V	Locked rotor torque	: 290 %
Rated current	: 1.77-1.60/0.802 A	Breakdown torque	: 400 %
Insulation class	: F		

Notes:

Generated for Model #.5018XS3E56C

Performed by	Checked

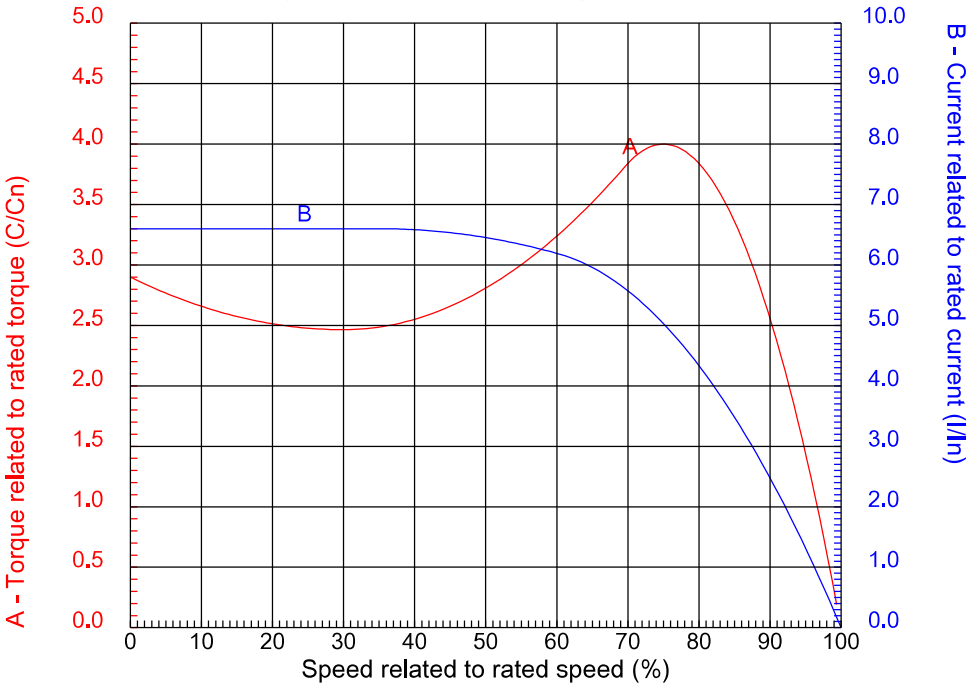
Dealers Industrial Equipment

No.:

Date: 12-SEP-2016

CHARACTERISTIC CURVES RELATED TO SPEED

Three-phase induction motor - Squirrel cage rotor



Customer	:		
Product line	:	Three-Phase: Fractional Explosion Proof Motors	

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Full load speed	: 1725 rpm	Design	: A
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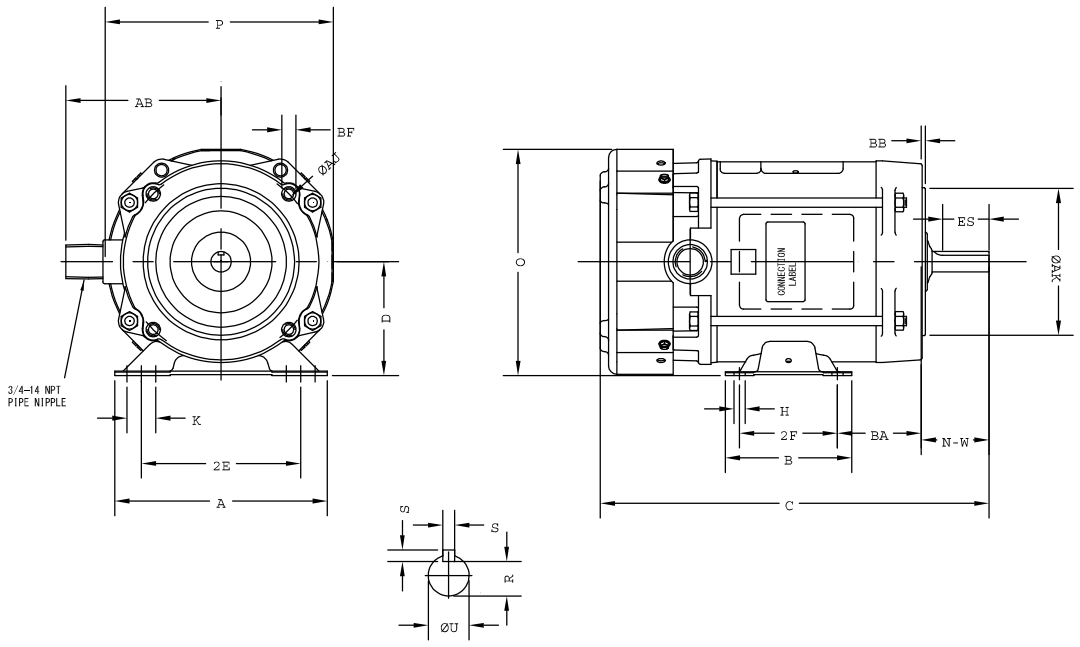
Rated current	: 1.77-1.60/0.802 A	Breakdown torque	: 400 %
Insulation class	: F		

Notes:

Generated for Model #.5018XS3E56C

Performed by	Checked



Notes: Downloaded from http://dealerselectric.com
Generated for Model #.5018XS3E56C

Performed by:

Checked:

Customer:

Three-Phase: Fractional Explosion Proof Motors

2E 4.880	A 6.500	P 6.980	B 3.880	BA 2.750
U 0.6250	N-W 1.880	ES 1.380	S 0.190	R 0.517
D 3.500	O 6.920	H 0.340	C 11.920	d1 SEM
Flange FC-149	AJ 5.880	AK 4.500	BD 6.000	BF UNC 3/8"x16-2B
BB 0.160	AH 2.060			

Three-phase induction motor
Frame 56 - IP55

12-SEP-2016

G12-G14-G16
Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

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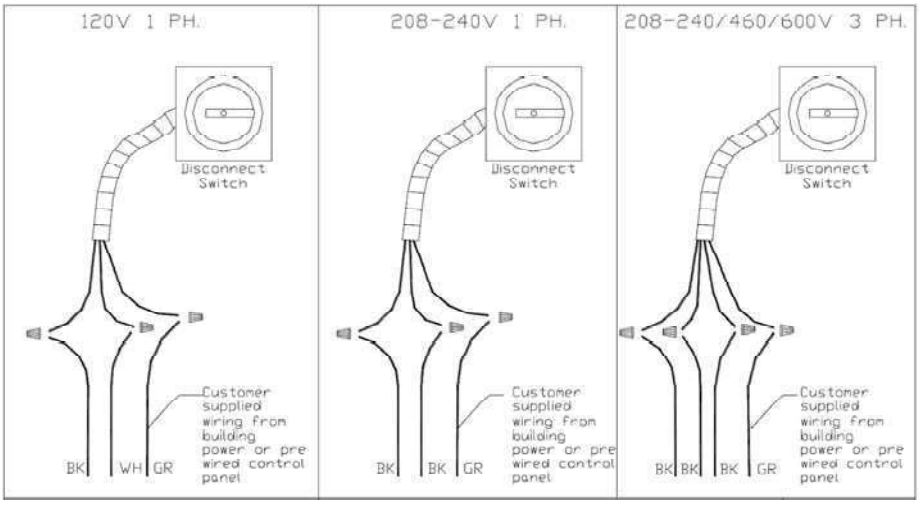

OPERATION

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Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
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5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

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	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12895579
		Catalog # :	.5012ES3E56C-S

Frame	: 56C	Locked rotor time	: 39s (cold) 22s (hot)
Output	: 0.5 HP (0.37 kW)	Temperature rise	: 80 K
Poles	: 6	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 208-230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 2.19-1.98/0.992 A	Protection degree	: IP55
L. R. Amperes	: 11.8-10.7/5.36 A	Cooling method	: IC411 - TEFC
LRC	: 5.4x(Code K)	Mounting	: F-1
No load current	: 1.33-1.54/0.772 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1160 rpm	Noise level[2]	: 50.0 dB(A)
Slip	: 3.33 %	Starting method	: Direct On Line
Rated torque	: 2.26 ft.lb	Approx. weight[3]	: 26.6 lb
Locked rotor torque	: 210 %		
Breakdown torque	: 300 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 0.1065 sq.ft.lb		

Output	25%	50%	75%	100%
Efficiency (%)	62.0	64.0	70.0	72.0
Power Factor	0.24	0.44	0.56	0.65

Foundation loads	
Max. traction	: 52 lb
Max. compression	: 78 lb

		Drive end	Non drive end
Bearing type	:	6203 ZZ	6202 ZZ
Sealing	:	V'Ring	Without Bearing Seal
Lubrication interval	:	-	-
Lubricant amount	:	-	-
Lubricant type	:	Mobil Polyrex EM	

Notes
USABLE @208V SF 1.00

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

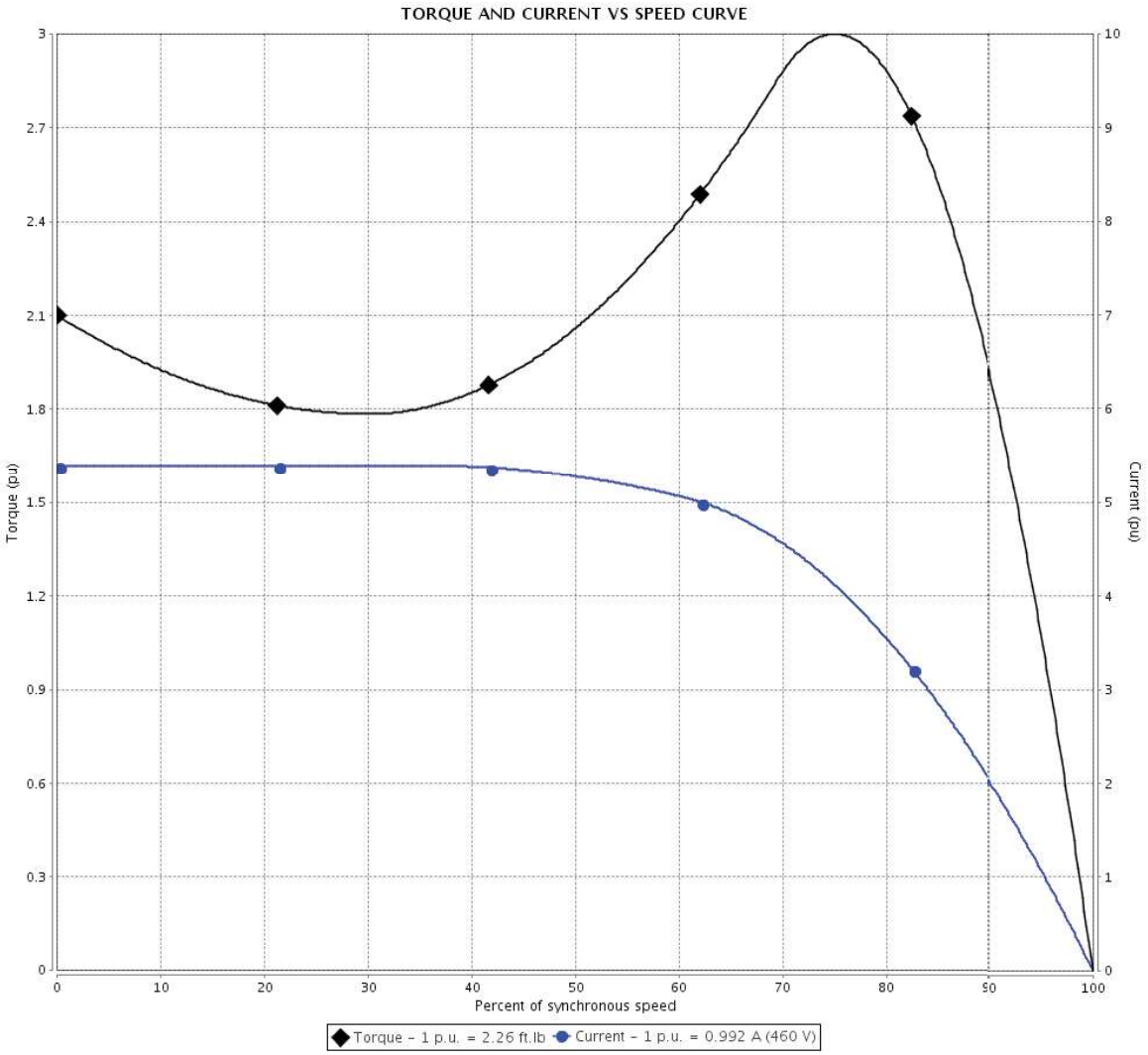
Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	13/04/2021		1 / 5	

TORQUE AND CURRENT VS SPEED CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:		
Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12895579
		Catalog # :	.5012ES3E56C-S



Performance	: 208-230/460 V 60 Hz 6P		
Rated current	: 2.19-1.98/0.992 A	Moment of inertia (J)	: 0.1065 sq.ft.lb
LRC	: 5.4	Duty cycle	: Cont.(S1)
Rated torque	: 2.26 ft.lb	Insulation class	: F
Locked rotor torque	: 210 %	Service factor	:
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1160 rpm		
Locked rotor time	: 39s (cold) 22s (hot)		

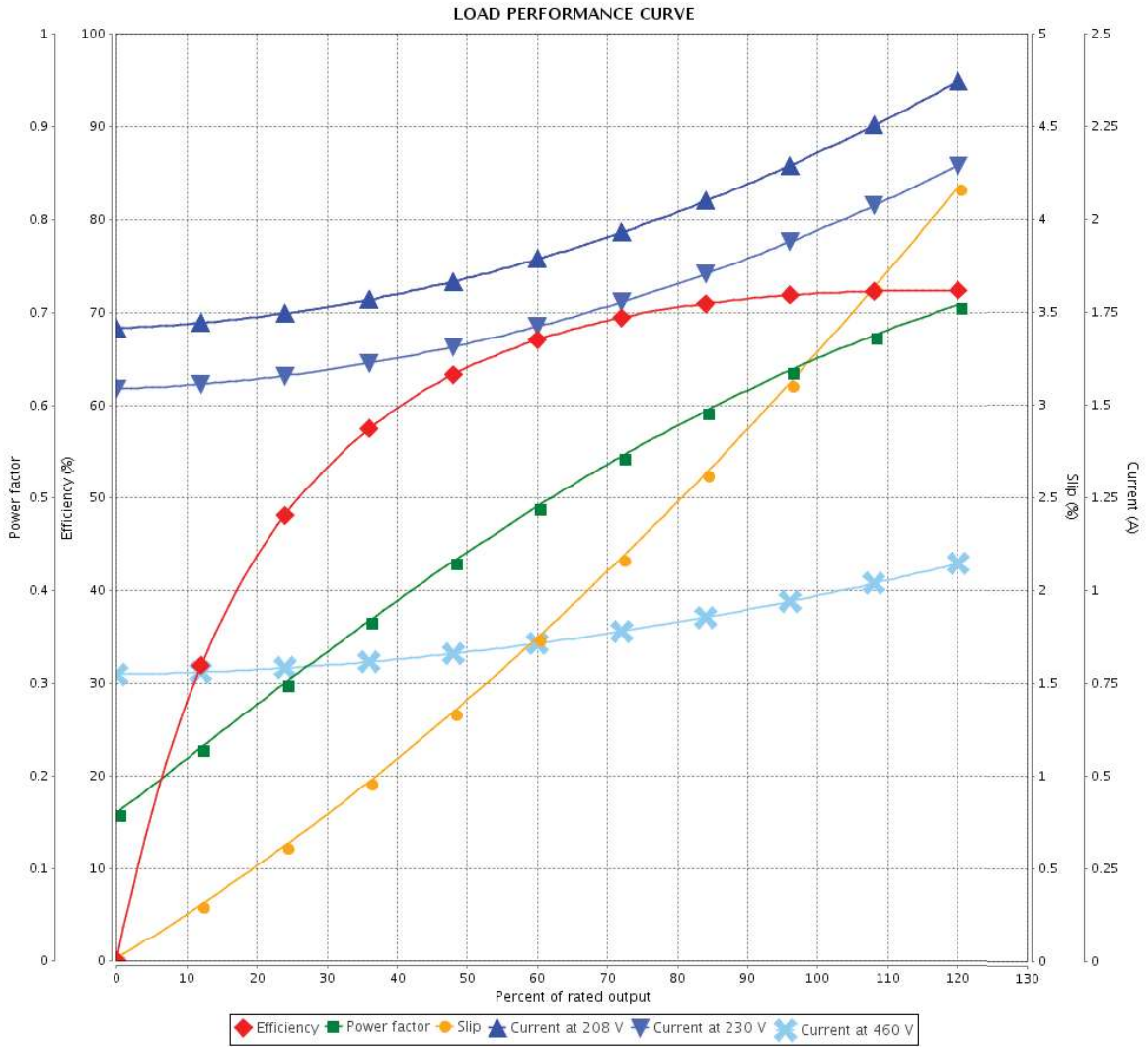
Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	13/04/2021		2 / 5	

LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:		
Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12895579
		Catalog # :	.5012ES3E56C-S



Performance	: 208-230/460 V 60 Hz 6P		
Rated current	: 2.19-1.98/0.992 A	Moment of inertia (J)	: 0.1065 sq.ft.lb
LRC	: 5.4	Duty cycle	: Cont.(S1)
Rated torque	: 2.26 ft.lb	Insulation class	: F
Locked rotor torque	: 210 %	Service factor	:
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1160 rpm		

Rev.	Changes Summary	Performed	Checked	Date

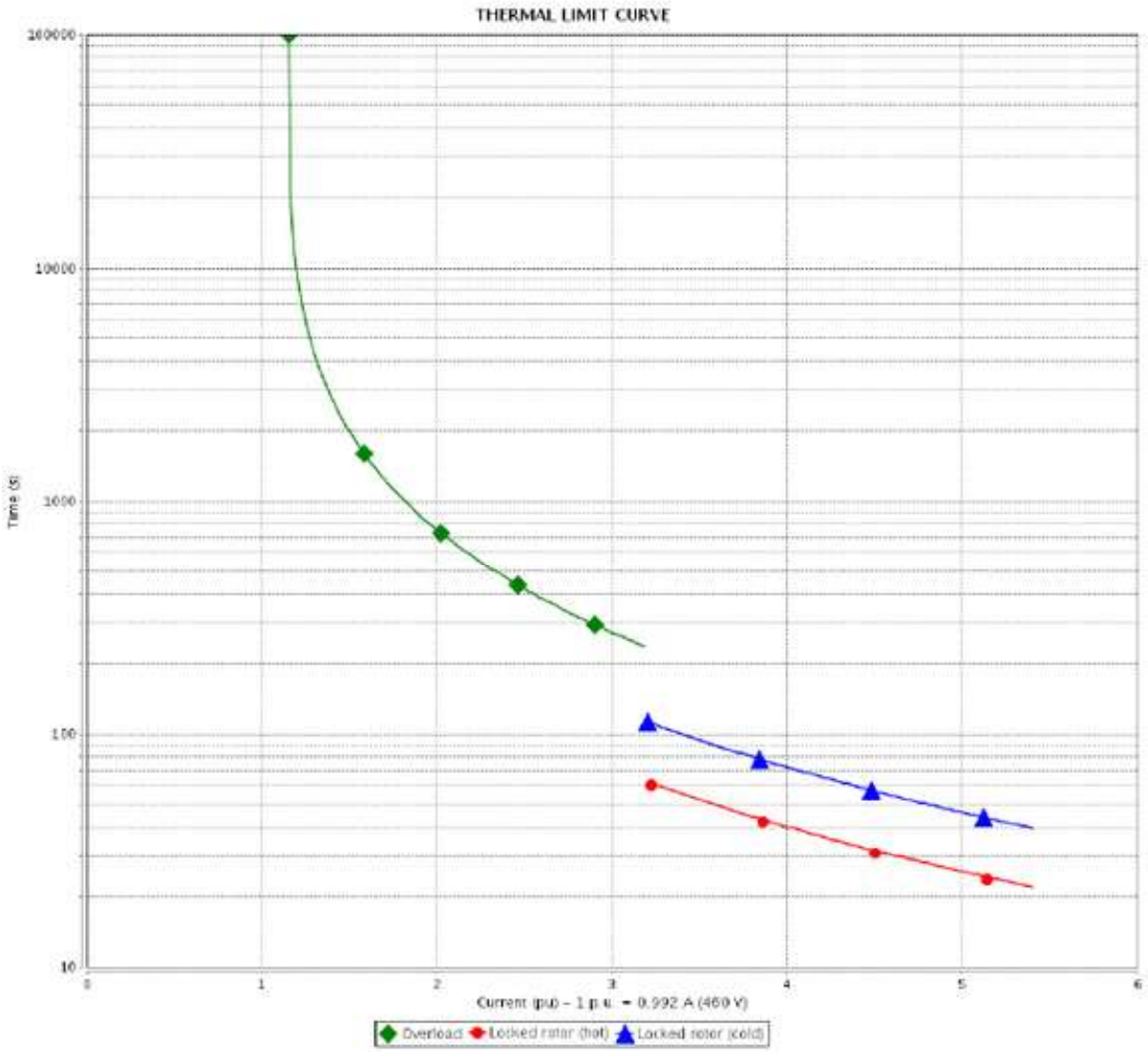
Performed by				
Checked by			Page	Revision
Date	13/04/2021		3 / 5	

THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12895579
		Catalog # :	.5012ES3E56C-S



Performance	: 208-230/460 V 60 Hz 6P		
Rated current	: 2.19-1.98/0.992 A	Moment of inertia (J)	: 0.1065 sq.ft.lb
LRC	: 5.4	Duty cycle	: Cont.(S1)
Rated torque	: 2.26 ft.lb	Insulation class	: F
Locked rotor torque	: 210 %	Service factor	:
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1160 rpm		
Heating constant			
Cooling constant			

Rev.	Changes Summary	Performed	Checked	Date

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Checked by			Page	Revision
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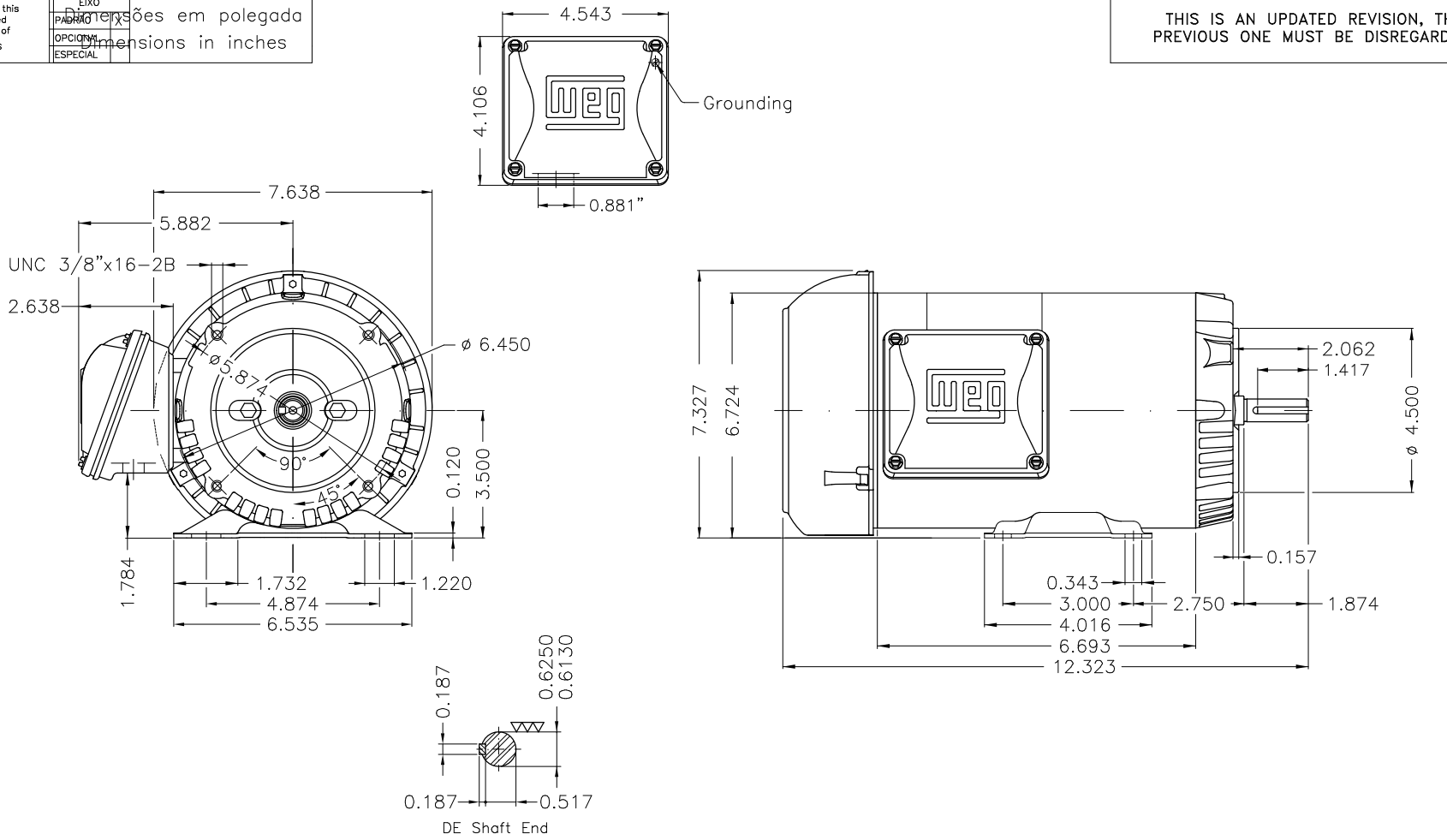
EIXO	
PADRÃO	X
OPCIONAL	
ESPECIAL	

Dimensões em polegada
Dimensions in inches

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.



Color Munsell N 1 matte black
Painting plan 207N
Mounting F-1/B34R(D)

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER

EXECUTED	USERADMIN	THREE PHASE MOTOR CLOSED ROLLED STEEL	
CHECKED		FRAME 56C IP55 TEFC	
RELEASED		WEG code: 12895579	
REL DT	13.04.2021	WMO Jaragua do Sul Product Engineering	SHEET 1 / 1

0.5 HP 06 Poles 60Hz

A

ZME A3

3PT9

C UL US LISTED

FOR SAFE AREA

C CSA US

MADE IN BRAZIL

MAT: 12895579

W01.TE0IC0X0X

For 60Hz: Class I, Zone 2, IIC

Class I, Div.2, Gr. A,B,C,D - T3

Div 2 Inverter Duty (SF1.00)

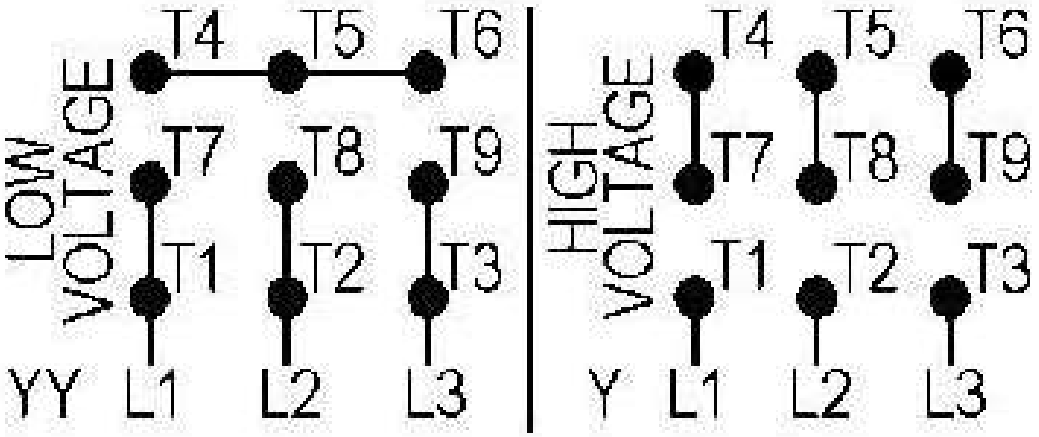
30OUT2019

CT 2:1/VT 1000:1

PH 3	FR 56C	HP(kW) 0.50(0.37)	Hz 60
V 230/460		RPM 1160	
A 1.98/0.992		DUTY CONT.	
SFA 2.28/1.14		CODE K	DES - IP55
SF 1.15	INS CL F ΔT 80K	AMB 40°C	ENCL TEFC
PF 0.65	NEMA NOM.EFF. 72.0%		
ALT 1000 m.a.s.l.	USABLE @ 208V 2.19A SF1.00		

ALTERNATE RATING: 0.50HP 50Hz 190-220/380-415V SF1.15

2.14-2.02/1.07-1.07A 945RPM EFF 69.8% (IE2) IEC 60034-1



T1-BLU T2-WHT
T3-ORG T4-YEL
T5-BLK T6-GRY
T7-PNK T8-RED
T9-RED BRK

For safe area-Inverter duty motor For 60Hz use on VPWM 1000:1 VT, 10:1 CT

DE: 6203-ZZ	ODE: 6202-ZZ	MOBIL POLYREX EM	

WARNING: Motor must be grounded in accordance with local and national electrical codes to prevent serious electrical shocks. Disconnect power source before servicing unit.

AVERTISSEMENT: Le moteur doit être mis à la terre conformément aux codes électriques locaux et nationaux afin d'éviter tout choc électrique grave. Déconnectez l'alimentation avant l'entretien de la machine.

G12-XP - G14-XP - G16-XP - G24

Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

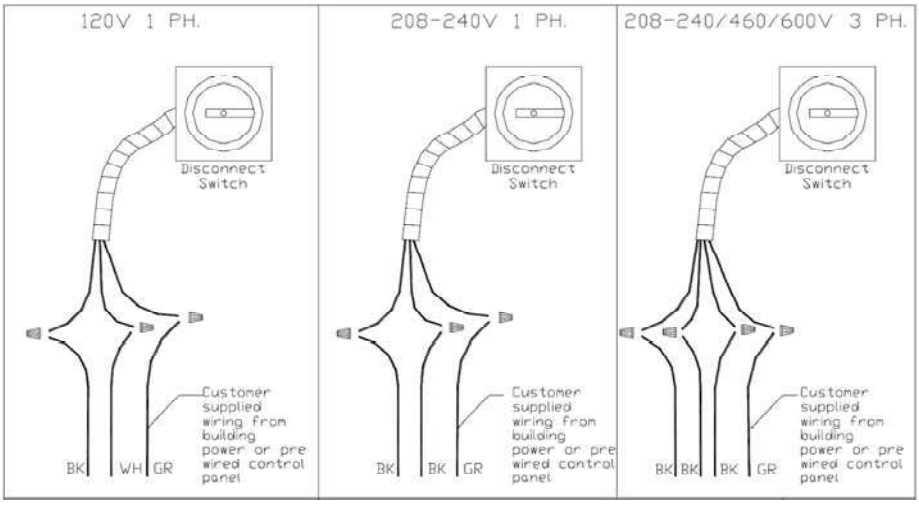
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14281753
		Catalog # :	00112XT3E145TC

Frame	: 143/5TC	Locked rotor time	: 50s (cold) 28s (hot)
Output	: 1 HP (0.75 kW)	Temperature rise	: 80 K
Poles	: 6	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 208-230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 3.60-3.26/1.63 A	Protection degree	: IP55
L. R. Amperes	: 22.3-20.2/10.1 A	Cooling method	: IC411 - TEFC
LRC	: 6.2x(Code K)	Mounting	: F-1
No load current	: 1.75-2.04/1.02 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1145 rpm	Noise level[2]	: 50.0 dB(A)
Slip	: 4.58 %	Starting method	: Direct On Line
Rated torque	: 0.634 kgfm	Approx. weight[3]	: 35.0 kg
Locked rotor torque	: 260 %		
Breakdown torque	: 300 %		
Insulation class	: F		
Service factor	: 1.15		
Design	: B		

Output	25%	50%	75%	100%
Efficiency (%)	0.000	77.0	82.0	82.5
Power Factor	0.00	0.51	0.63	0.70

Foundation loads	
Max. traction	: 36 kgf
Max. compression	: 71 kgf

		Drive end	Non drive end
Bearing type	:	6205 2RS	6204 2RS
Sealing	:	Oil Seal	Lip Seal
Lubrication interval	:	0 h	0 h
Lubricant amount	:	0 g	0 g
Lubricant type	:	Mobil Polyrex EM	

Notes

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

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Customer :

Thermal protection

ID	Application	Type	Quantity	Sensing Temperature
1	Winding	Thermostat - 2 wires	1 x Phase	155 ºC

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
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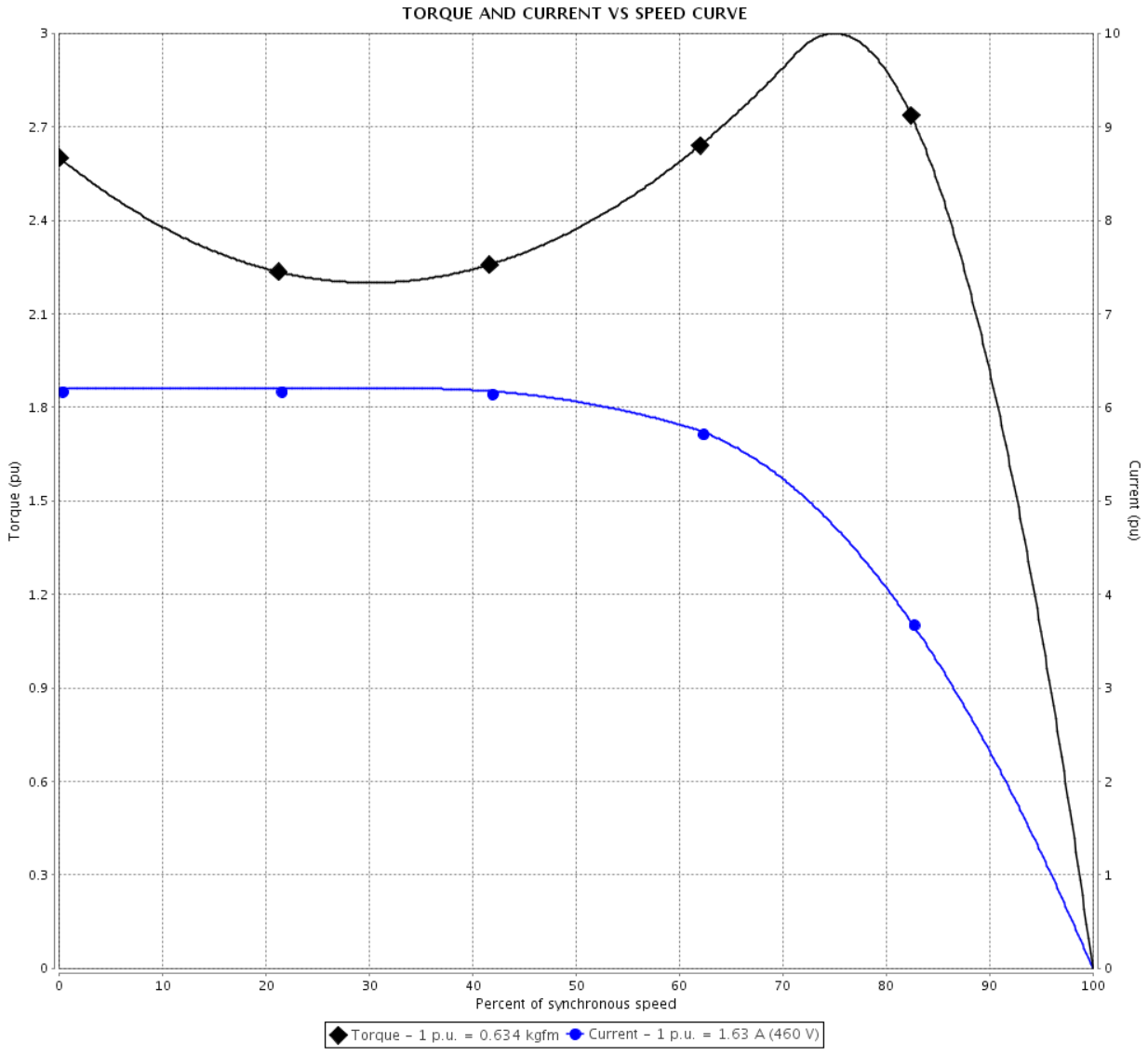
TORQUE AND CURRENT VS SPEED CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14281753
		Catalog # :	00112XT3E145TC



Performance	: 208-230/460 V 60 Hz 6P

Rated current	: 3.60-3.26/1.63 A	Moment of inertia (J)	
LRC	: 6.2	Duty cycle	: Cont.(S1)
Rated torque	: 0.634 kgfm	Insulation class	: F
Locked rotor torque	: 260 %	Service factor	: 1.15
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1145 rpm	Design	: B

Locked rotor time	: 50s (cold) 28s (hot)

Rev.	Changes Summary	Performed	Checked	Date

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Checked by			Page	Revision
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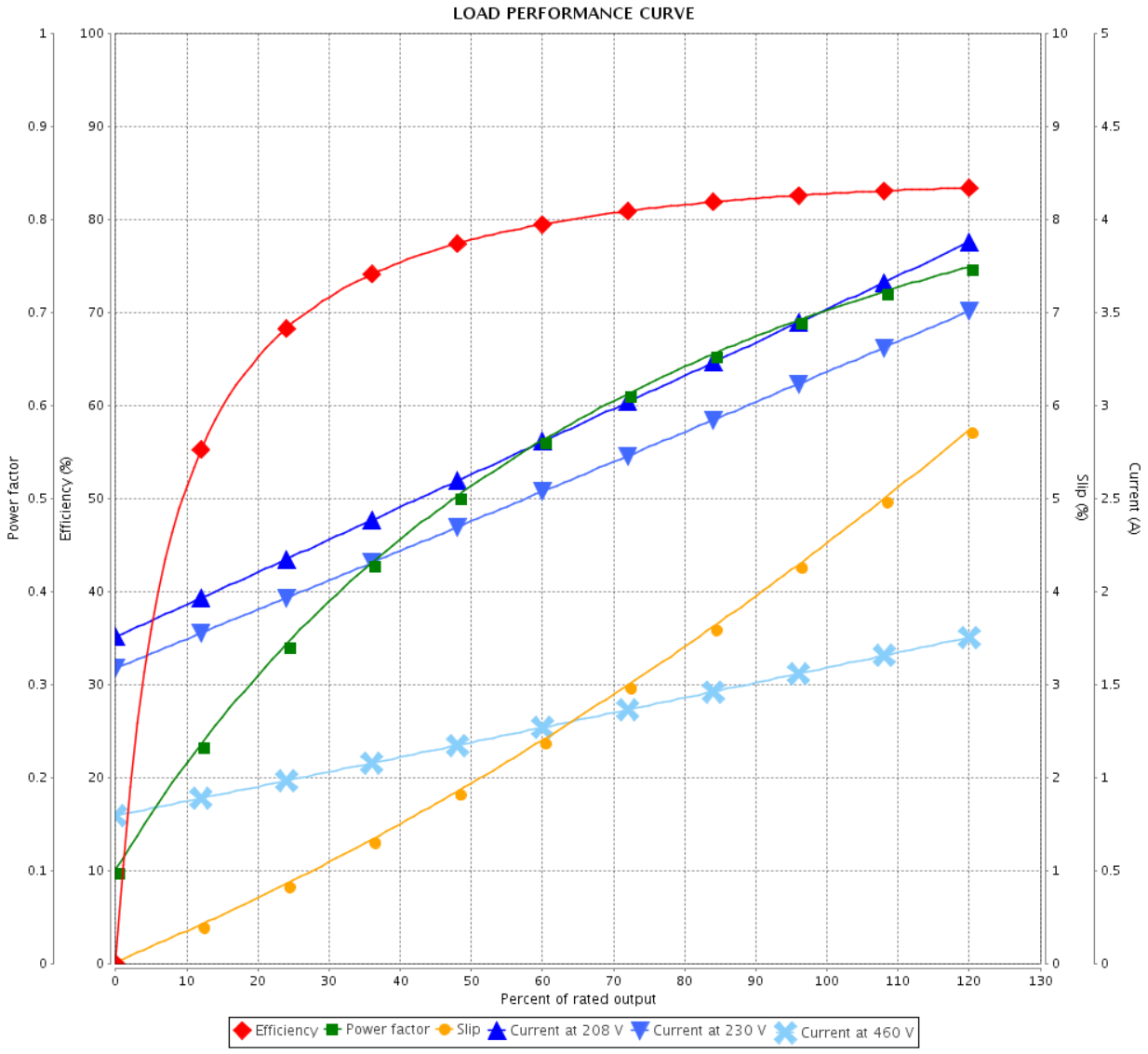
LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:		
Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14281753
		Catalog # :	00112XT3E145TC



Performance	: 208-230/460 V 60 Hz 6P		
Rated current	: 3.60-3.26/1.63 A	Moment of inertia (J)	
LRC	: 6.2	Duty cycle	: Cont.(S1)
Rated torque	: 0.634 kgfm	Insulation class	: F
Locked rotor torque	: 260 %	Service factor	: 1.15
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1145 rpm	Design	: B

Rev.	Changes Summary	Performed	Checked	Date

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Checked by			Page	Revision
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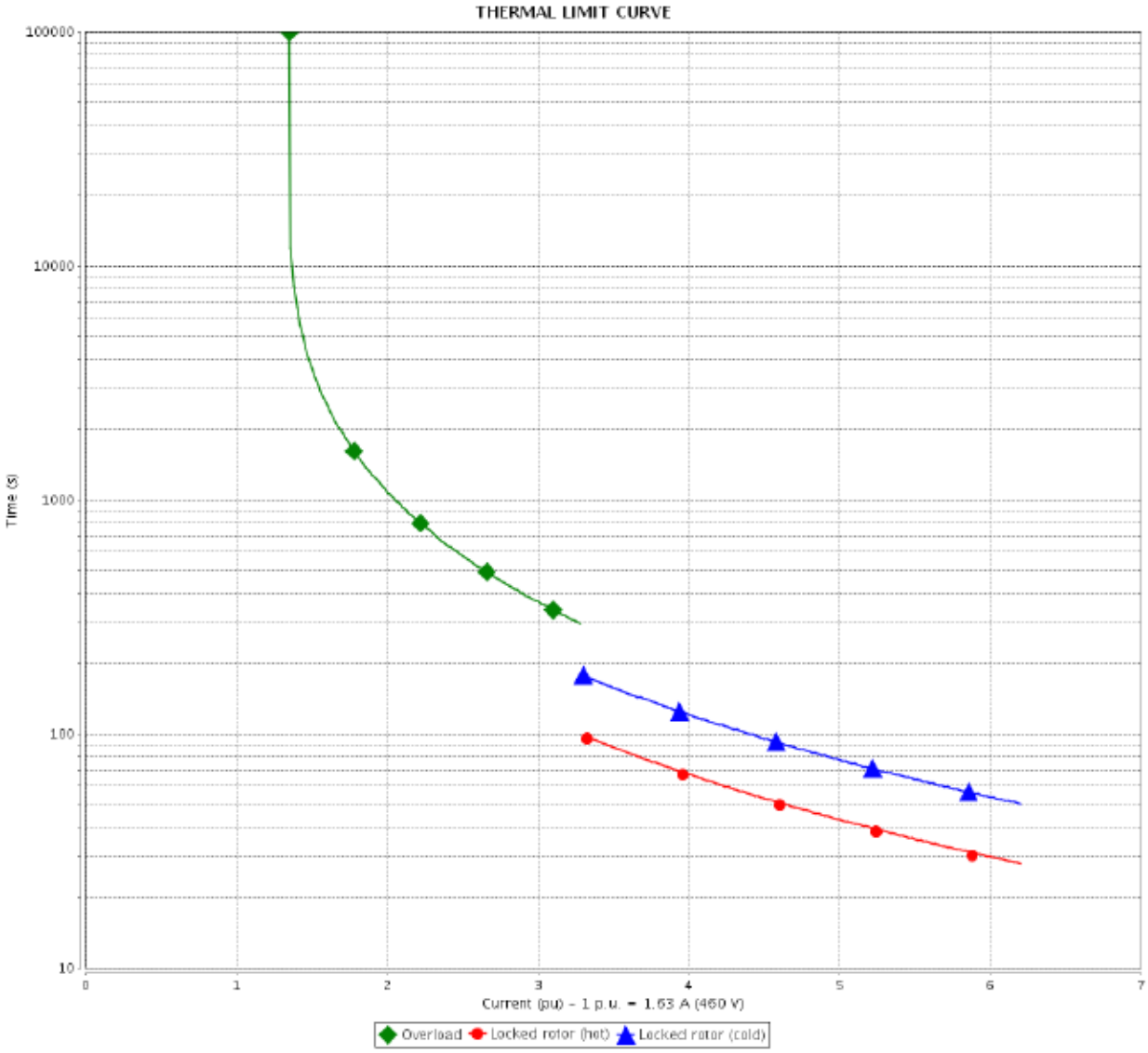
THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14281753
		Catalog # :	00112XT3E145TC



Performance	: 208-230/460 V 60 Hz 6P

Rated current	: 3.60-3.26/1.63 A	Moment of inertia (J)	
LRC	: 6.2	Duty cycle	: Cont.(S1)
Rated torque	: 0.634 kgfm	Insulation class	: F
Locked rotor torque	: 260 %	Service factor	: 1.15
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1145 rpm	Design	: B
Heating constant			
Cooling constant			

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
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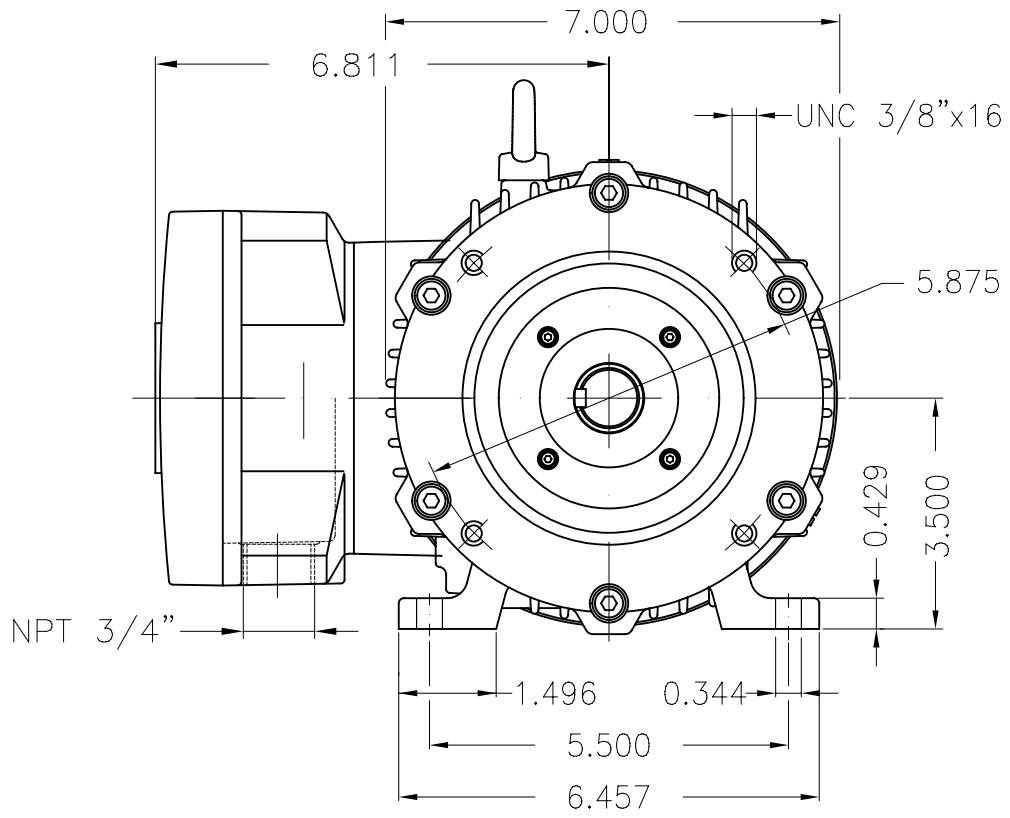
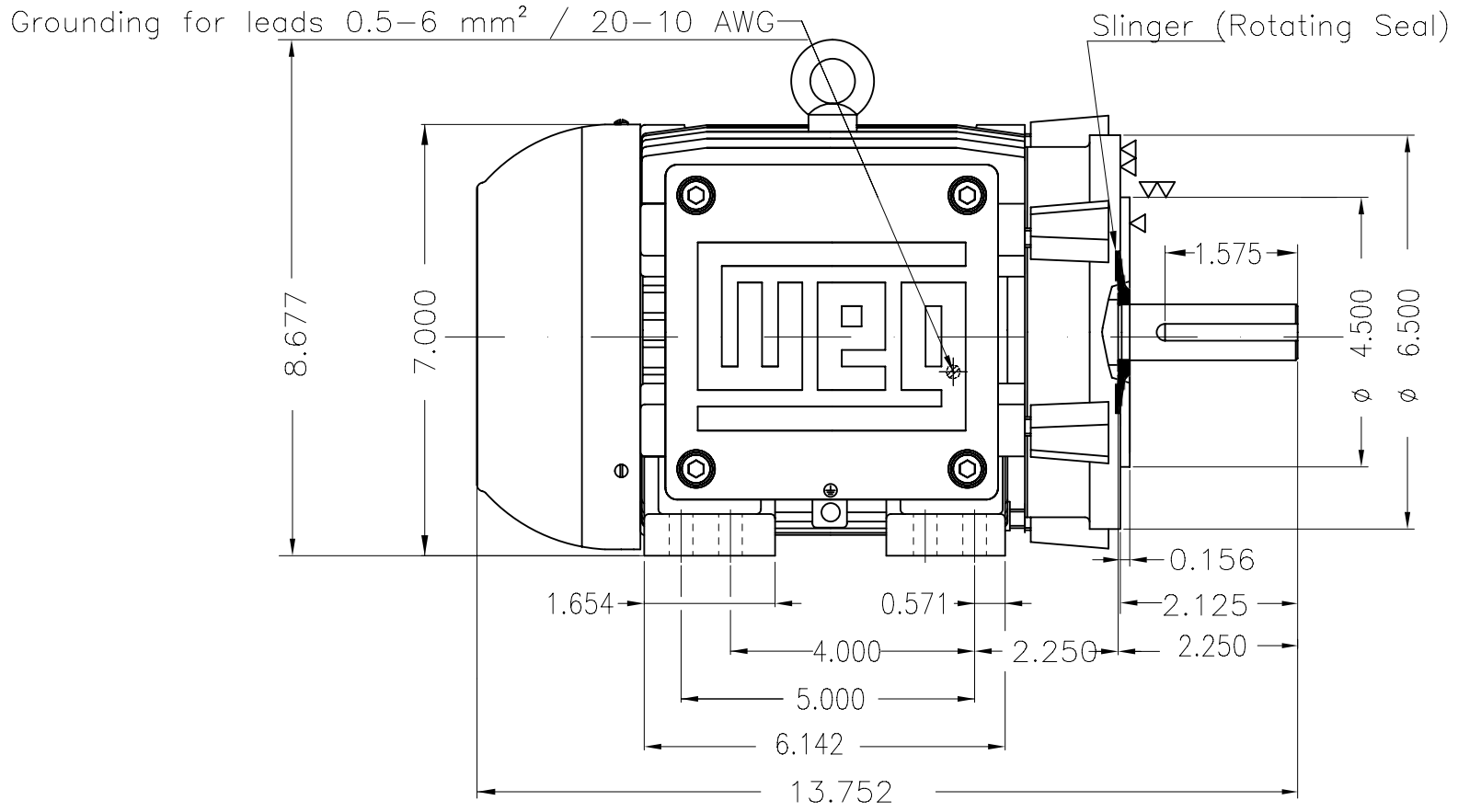
EIXO
PADRÃO X
OPCIONAL
ESPECIAL

Dimensões em polegada
Dimensions in inches

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.





Color RAL 5009
Painting plan 202P
Mounting B34R(D)

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER

EXECUTED	USERADMIN	THREE-PHASE EXPLOSION PROOF MOTOR		
CHECKED		FRAME 143/5TC IP55 TEFC		
RELEASED		WEG code: 14281753		
REL DT	13.04.2021	WMO Jaragua do Sul Product Engineering	SHEET	1 / 1

1 HP 06 Poles 60Hz

A

ZME A3

MADE IN BRAZIL

W21X NEMA Premium®

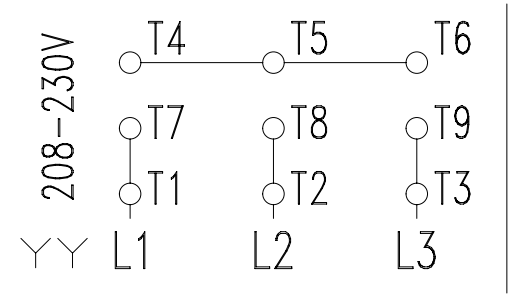
14281753

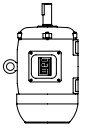
CC029A
Inverter Duty Motor
Severe Duty

UL LISTED

MODEL 00112XT3E145TC

PH 3	FR 143/5TC	
HP(kW) 1.0(0.75)	HZ 60	IP55
V 230/460	A 3.26/1.63	
RPM 1145	NEMA NOM EFF 82.5%	
PF 0.70	SFA 3.75/1.87	DES B
INS CL F ΔT 80 K	SF 1.15	ENCL TEFC
DUTY CONT.	CODE K	ALT 1000 m.a.s.l.
AMB 40°C	USABLE @208V 3.60 A	SF 1.00





6205-2RS MOBIL POLYREX EM

6204-2RS

79 Lbs

C SA® US
Energy Verified

TEMP CODE T3C
CSA/UL: Class I – Div. 1 – Groups C and D
CSA: Class II – Div. 1 – Groups F and G
CSA: Class I – Zone 1 – IIB
EXPLOSION PROOF MOTOR

FOR USE ON VPWM VFD 1000:1VT, 20:1CT, 1.0SF, T3C, AMB 40°C.

G24

Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

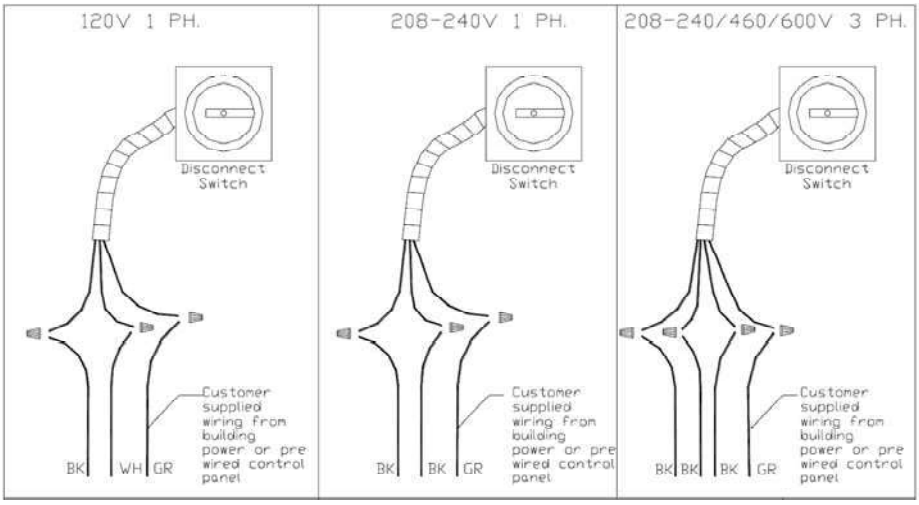
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12894836
		Catalog # :	.7512ES3E56C-S

Frame	: 56HC	Locked rotor time	: 37s (cold) 21s (hot)
Output	: 0.75 HP (0.550 kW)	Temperature rise	: 80 K
Poles	: 6	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 208-230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 2.96-2.68/1.34 A	Protection degree	: IP55
L. R. Amperes	: 17.2-15.5/7.77 A	Cooling method	: IC411 - TEFC
LRC	: 5.8x(Code K)	Mounting	: F-1
No load current	: 1.67-1.94/0.971 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1155 rpm	Noise level[2]	: 50.0 dB(A)
Slip	: 3.75 %	Starting method	: Direct On Line
Rated torque	: 3.41 ft.lb	Approx. weight[3]	: 31.0 lb
Locked rotor torque	: 229 %		
Breakdown torque	: 300 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 0.1331 sq.ft.lb		
Design	: A		

Output	25%	50%	75%	100%
Efficiency (%)	68.4	70.0	74.0	75.5
Power Factor	0.26	0.46	0.59	0.68

Foundation loads	
Max. traction	: 79 lb
Max. compression	: 110 lb

		Drive end	Non drive end
Bearing type	:	6203 ZZ	6202 ZZ
Sealing	:	V'Ring	Without Bearing Seal
Lubrication interval	:	-	-
Lubricant amount	:	-	-
Lubricant type	:	Mobil Polyrex EM	

Notes
USABLE @208V SF 1.00

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

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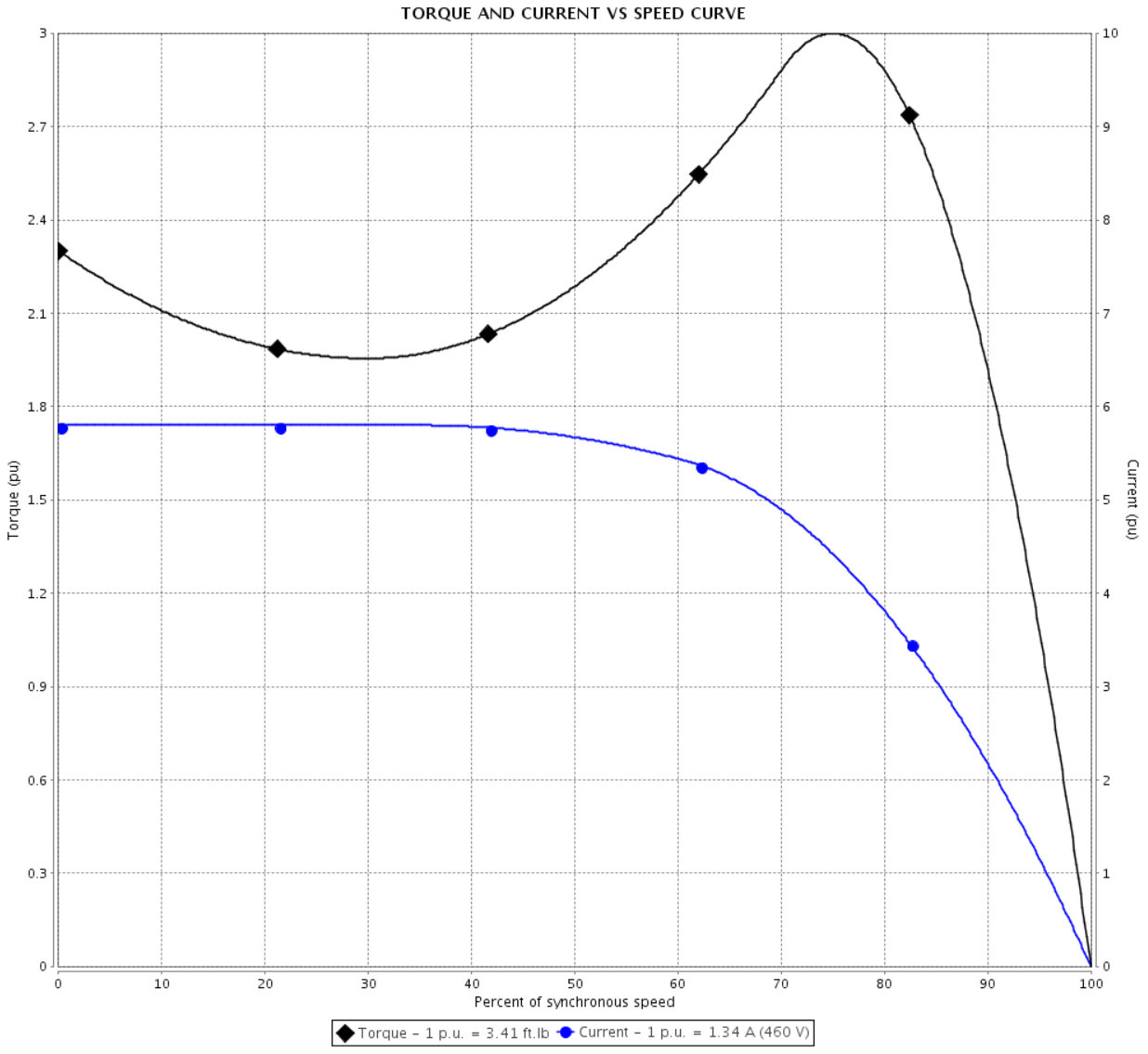
TORQUE AND CURRENT VS SPEED CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12894836
		Catalog # :	.7512ES3E56C-S



Performance	: 208-230/460 V 60 Hz 6P

Rated current	: 2.96-2.68/1.34 A	Moment of inertia (J)	: 0.1331 sq.ft.lb
LRC	: 5.8	Duty cycle	: Cont.(S1)
Rated torque	: 3.41 ft.lb	Insulation class	: F
Locked rotor torque	: 229 %	Service factor	:
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1155 rpm	Design	: A

Locked rotor time	: 37s (cold) 21s (hot)

Rev.	Changes Summary	Performed	Checked	Date

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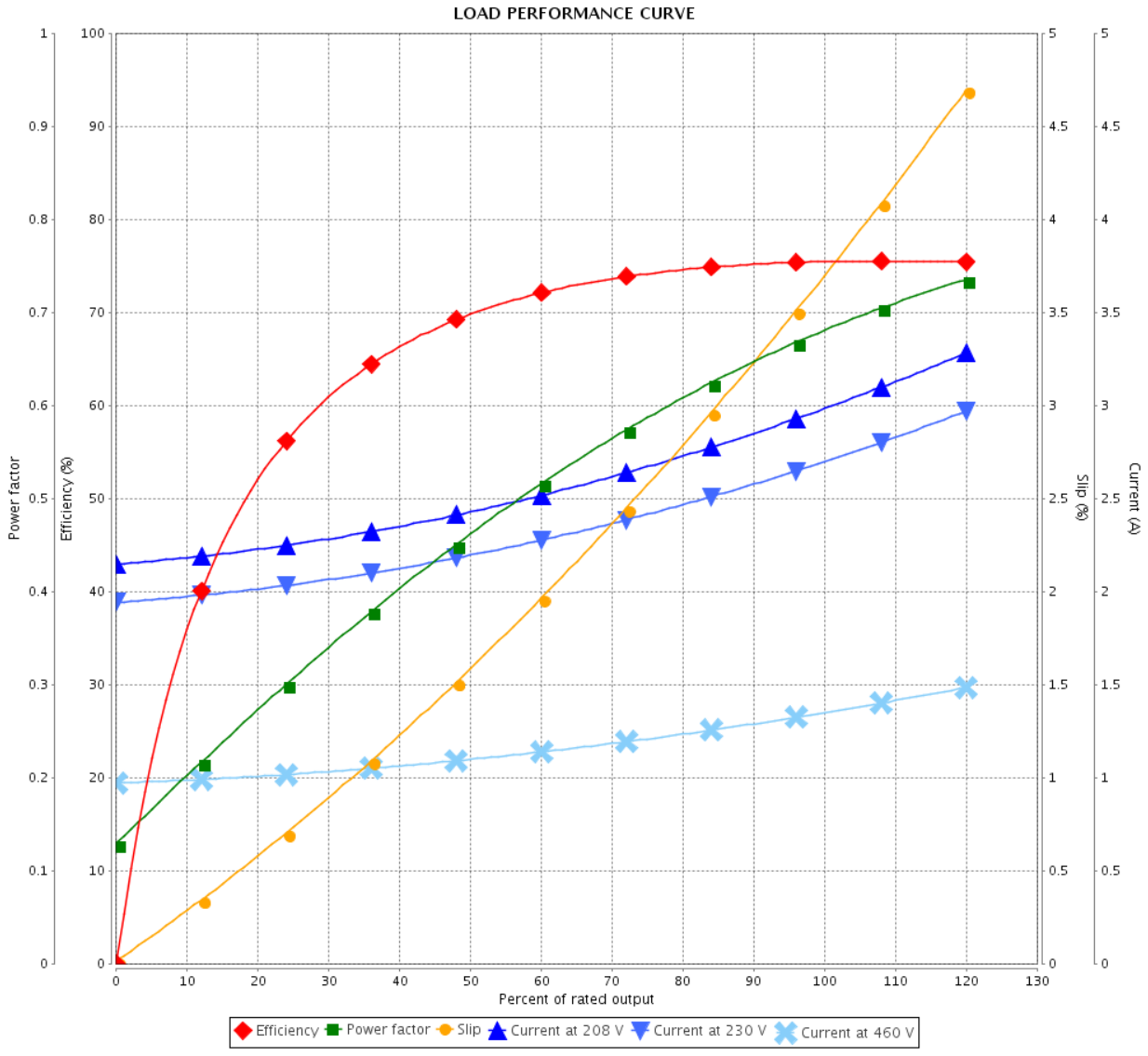
LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:		
Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12894836
		Catalog # :	.7512ES3E56C-S



Performance	: 208-230/460 V 60 Hz 6P		
Rated current	: 2.96-2.68/1.34 A	Moment of inertia (J)	: 0.1331 sq.ft.lb
LRC	: 5.8	Duty cycle	: Cont.(S1)
Rated torque	: 3.41 ft.lb	Insulation class	: F
Locked rotor torque	: 229 %	Service factor	:
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1155 rpm	Design	: A

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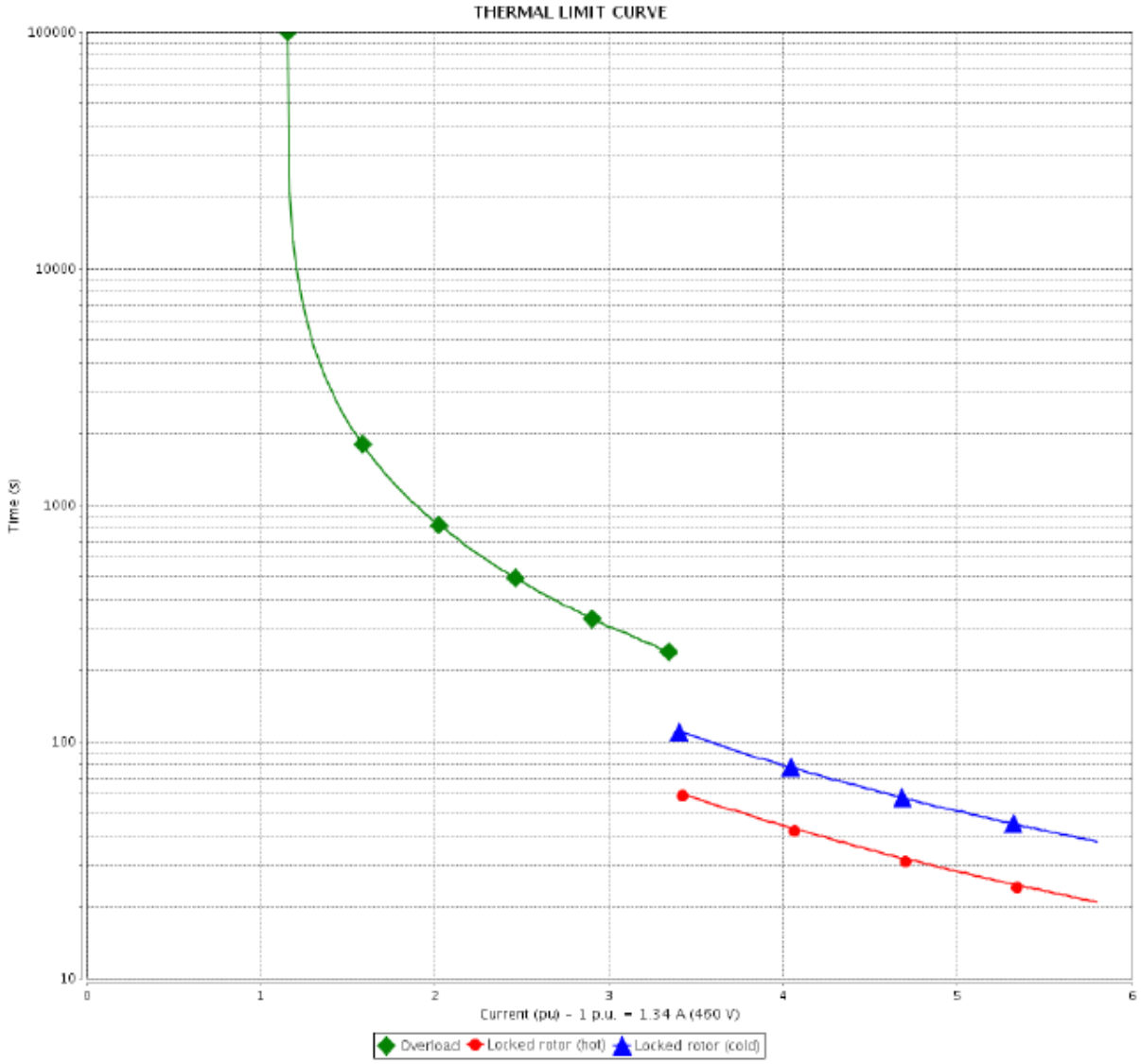
THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel Standard Efficiency Three-Phase	Product code :	12894836
		Catalog # :	.7512ES3E56C-S



Performance	: 208-230/460 V 60 Hz 6P

Rated current	: 2.96-2.68/1.34 A	Moment of inertia (J)	: 0.1331 sq.ft.lb
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Rated torque	: 3.41 ft.lb	Insulation class	: F
Locked rotor torque	: 229 %	Service factor	:
Breakdown torque	: 300 %	Temperature rise	: 80 K
Rated speed	: 1155 rpm	Design	: A

Heating constant	
Cooling constant	

Rev.	Changes Summary	Performed	Checked	Date

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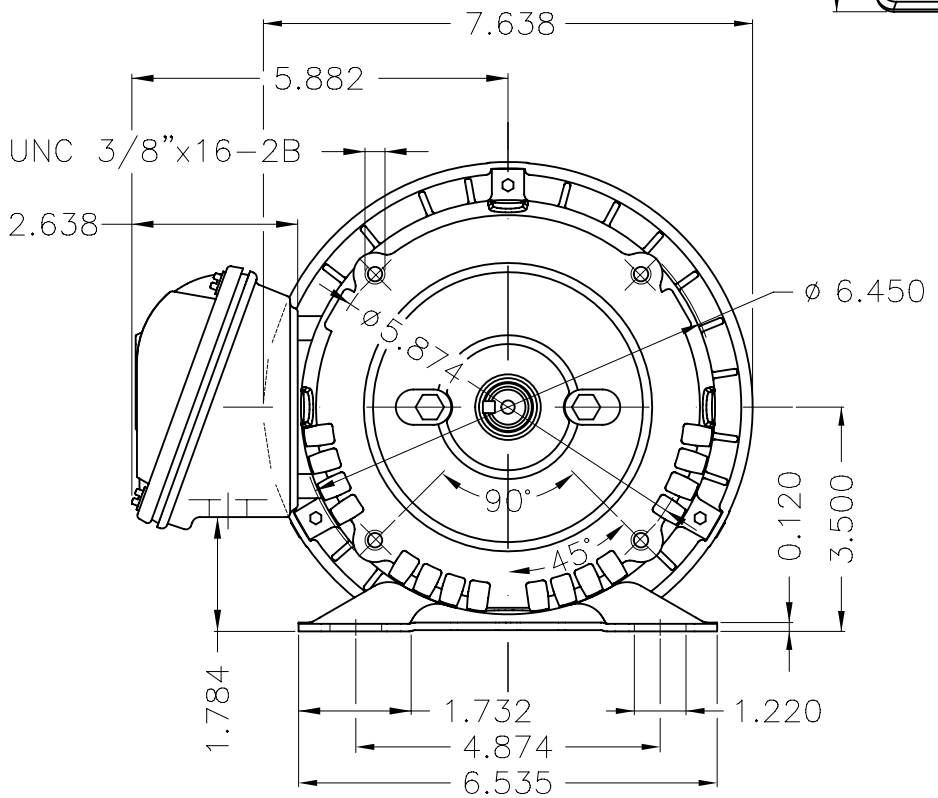
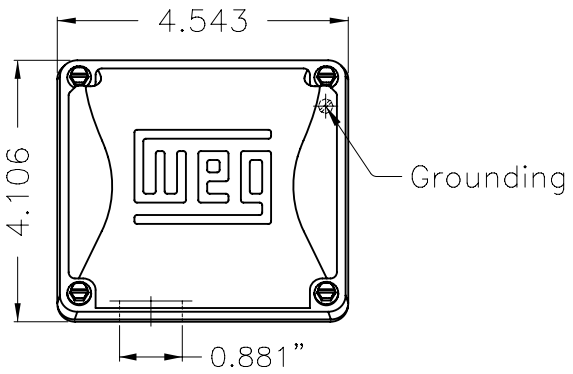
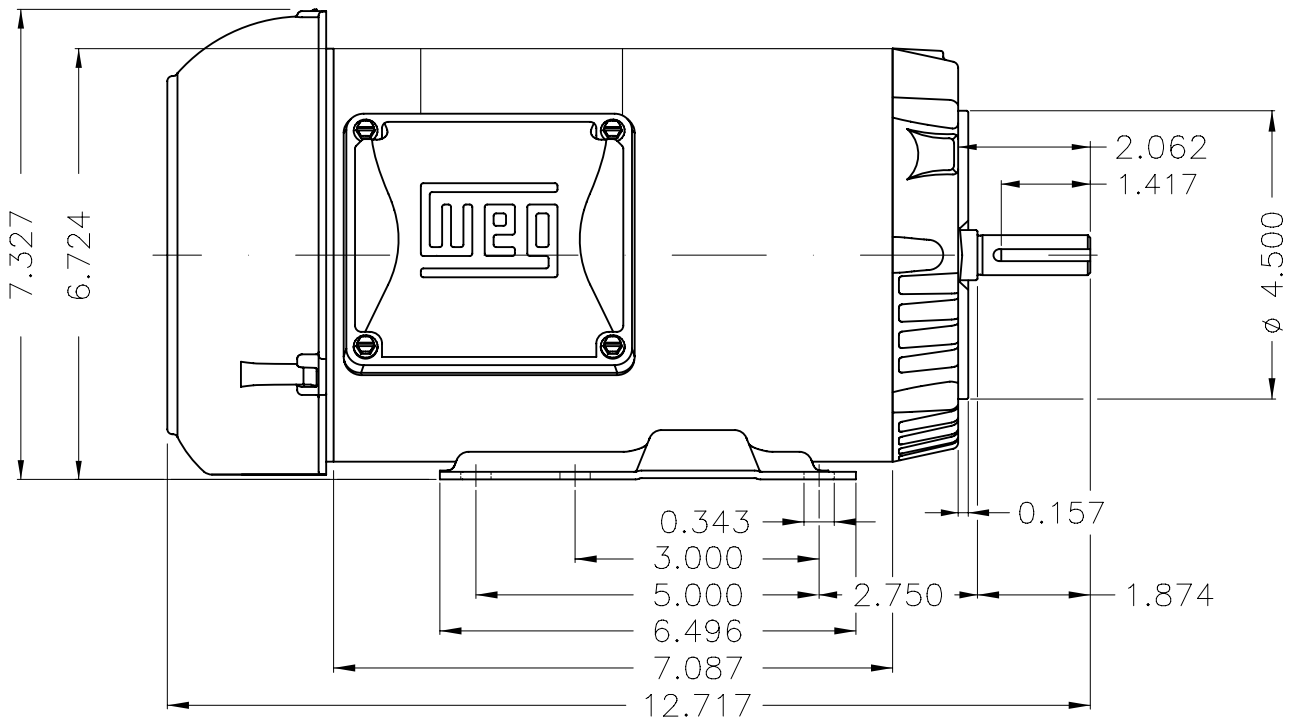
EIXO
PADRÃO X
OPCIONAL
ESPECIAL

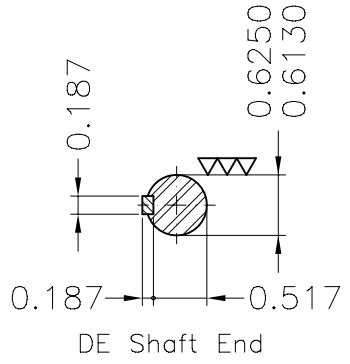
Dimensões em polegada
Dimensions in inches

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.









Color Munsell N 1 matte black
Painting plan 207N
Mounting F-1/B34R(D)

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER

EXECUTED	USERADMIN	THREE PHASE MOTOR CLOSED ROLLED STEEL			
CHECKED		FRAME 56HC IP55 TEFC			
RELEASED		WEG code: 12894836			
REL DT	13.04.2021	WMO	Jaragua do Sul	Product Engineering	SHEET 1 / 1

0.75 HP 06 Poles 60Hz

A

A3

ZME

3PT9

C UL US LISTED

FOR SAFE AREA

C CSA® US

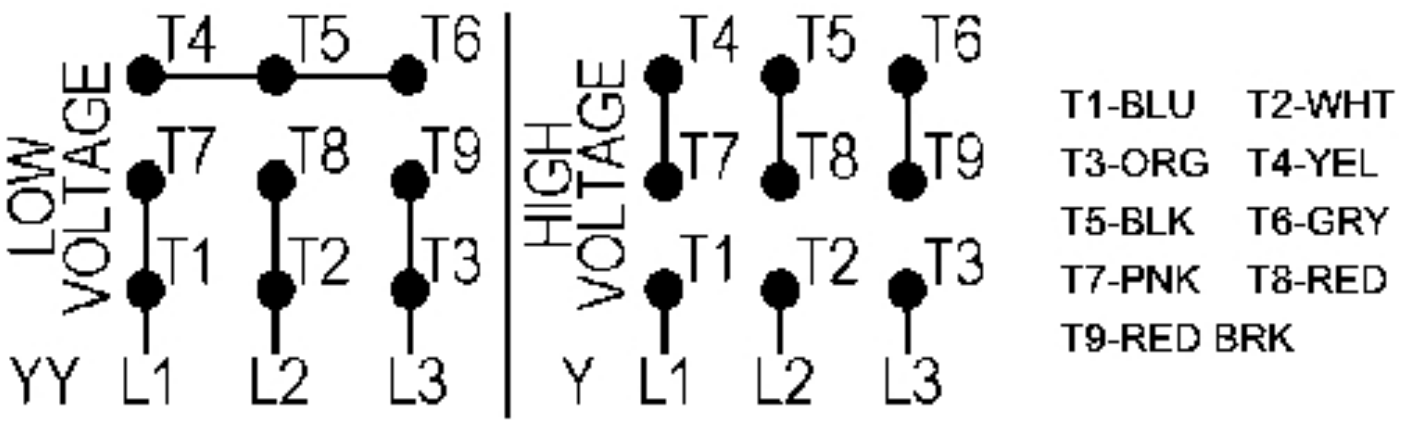
MADE IN MÉXICO

MAT: 12894836
W01.TE0IC0X0X
MODEL .7512ES3E56C-S
05JUL2019

For 60Hz: Class I, Zone 2, IIC
Class I, Div.2, Gr. A,B,C,D - T3
Div 2 Inverter Duty (SF1.00)
CT 2:1/VT 1000:1

PH 3	FR 56HC	HP(kW) 0.75(0.55)	Hz 60
V 230/460		RPM 1155	
A 2.68/1.34		DUTY CONT.	
SFA 3.08/1.54		CODE K	DES A IP55
SF 1.15	INS CL F ΔT 80K	AMB 40°C	ENCL TEFC
PF 0.68	NEMA NOM.EFF. 75.5%		
ALT 1000 m.a.s.l.	USABLE @ 208V 2.96A SF1.00		

ALTERNATE RATING: 0.75HP 50Hz 190-220/380-415V SF1.00
2.98-2.77/1.49-1.47A 935RPM EFF 72.6% (IE1) IEC 60034-1



INTERCHANGE ANY TWO LINE WIRES TO REVERSE THE ROTATION

For safe area-Inverter duty motor For 60Hz use on VPWM 1000:1 VT, 10:1 CT

DE: 6203-ZZ	ODE: 6202-ZZ	MOBIL POLYREX EM

WARNING: Motor must be grounded in accordance with local and national electrical codes to prevent serious electrical shocks. Disconnect power source before servicing unit.
AVERTISSEMENT: Le moteur doit être mis à la terre conformément aux codes électriques locaux et nationaux afin d'éviter tout choc électrique grave. Déconnectez l'alimentation avant l'entretien de la machine.

G26

Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

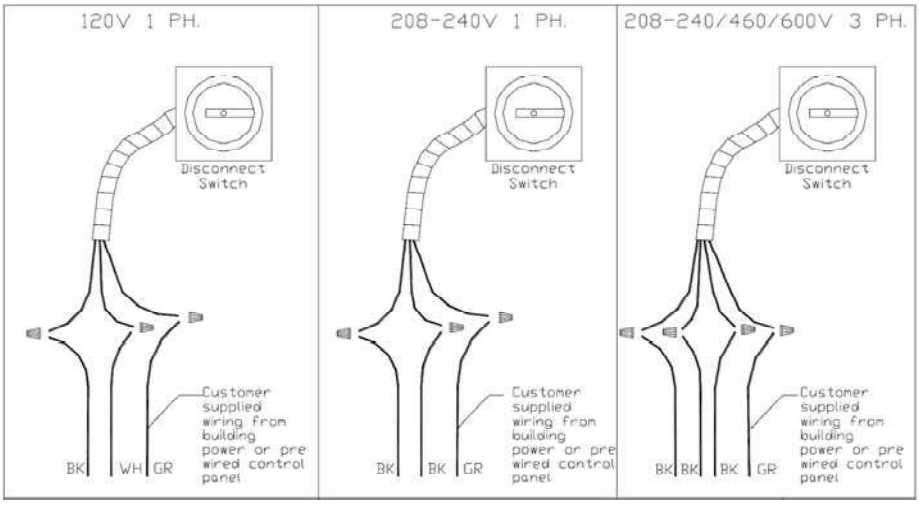
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel NEMA Premium Efficiency Three-Phase	Product code :	12675385
		Catalog # :	00212ET3E184TC-S

Frame	: 182/4TC	Locked rotor time	: 79s (cold) 44s (hot)
Output	: 2 HP (1.5 kW)	Temperature rise	: 80 K
Poles	: 6	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 6.00/3.00 A	Protection degree	: IP55
L. R. Amperes	: 45.0/22.5 A	Cooling method	: IC411 - TEFC
LRC	: 7.5x(Code K)	Mounting	: F-1
No load current	: 3.74/1.87 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1170 rpm	Noise level[2]	: 52.0 dB(A)
Slip	: 2.50 %	Starting method	: Direct On Line
Rated torque	: 8.98 ft.lb	Approx. weight[3]	: 91.2 lb
Locked rotor torque	: 260 %		
Breakdown torque	: 370 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 0.3424 sq.ft.lb		
Design	: B		

Output	25%	50%	75%	100%
Efficiency (%)	82.0	84.0	86.5	88.5
Power Factor	0.28	0.50	0.62	0.71

Foundation loads

Max. traction	: 178 lb
Max. compression	: 269 lb

		Drive end	Non drive end
Bearing type	:	6206 ZZ	6205 ZZ
Sealing	:	V'Ring	Without Bearing Seal
Lubrication interval	:	-	-
Lubricant amount	:	-	-
Lubricant type	:	Mobil Polyrex EM	

Notes
USABLE @208V 6.63A SF 1.00 SFA 6.63A

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
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These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

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TORQUE AND CURRENT VS SPEED CURVE

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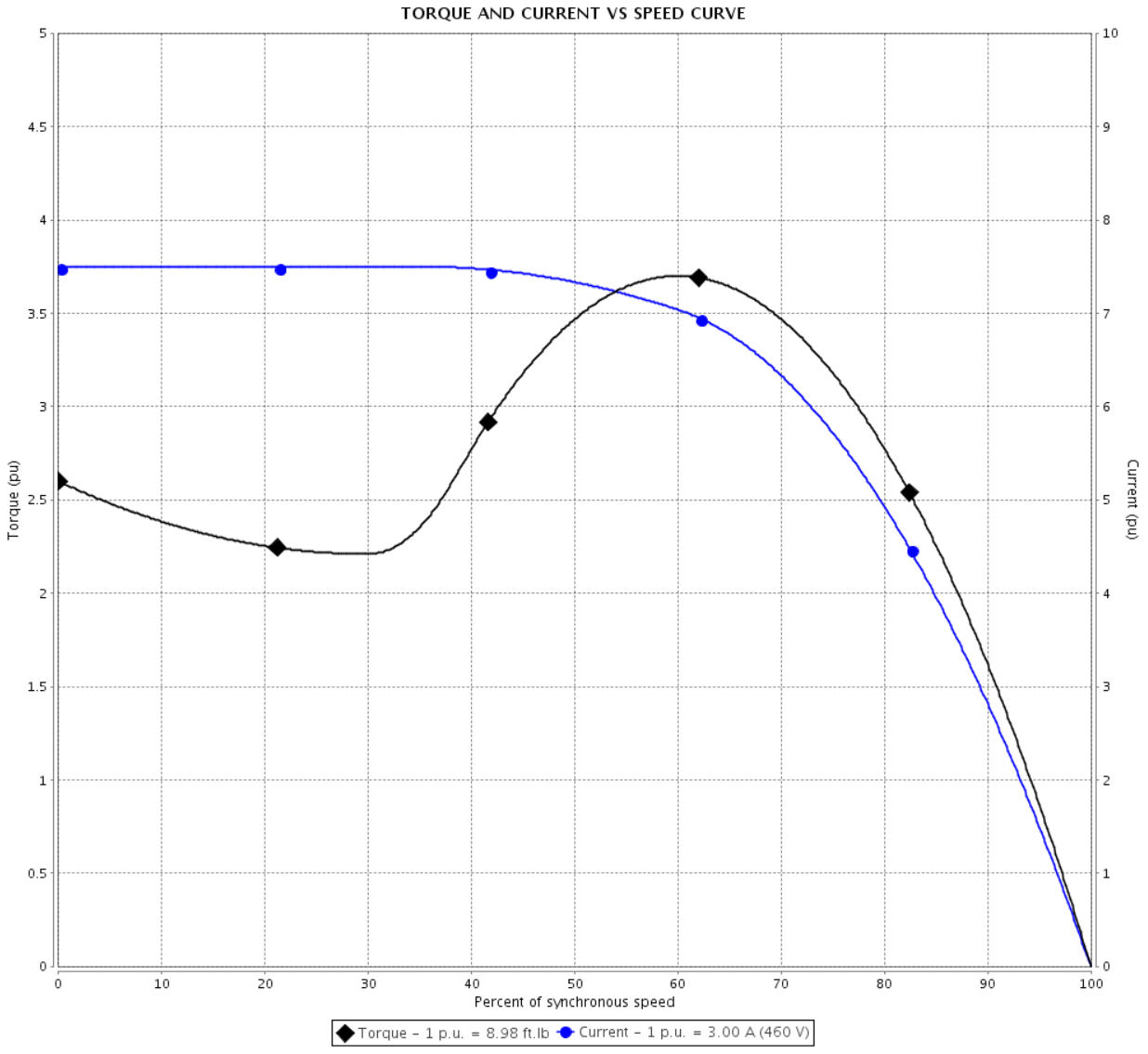

Performance	: 230/460 V 60 Hz 6P

Rated current	: 6.00/3.00 A	Moment of inertia (J)	: 0.3424 sq.ft.lb
LRC	: 7.5	Duty cycle	: Cont.(S1)
Rated torque	: 8.98 ft.lb	Insulation class	: F
Locked rotor torque	: 260 %	Service factor	: 1.15
Breakdown torque	: 370 %	Temperature rise	: 80 K
Rated speed	: 1170 rpm	Design	: B

Locked rotor time	: 79s (cold) 44s (hot)

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LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

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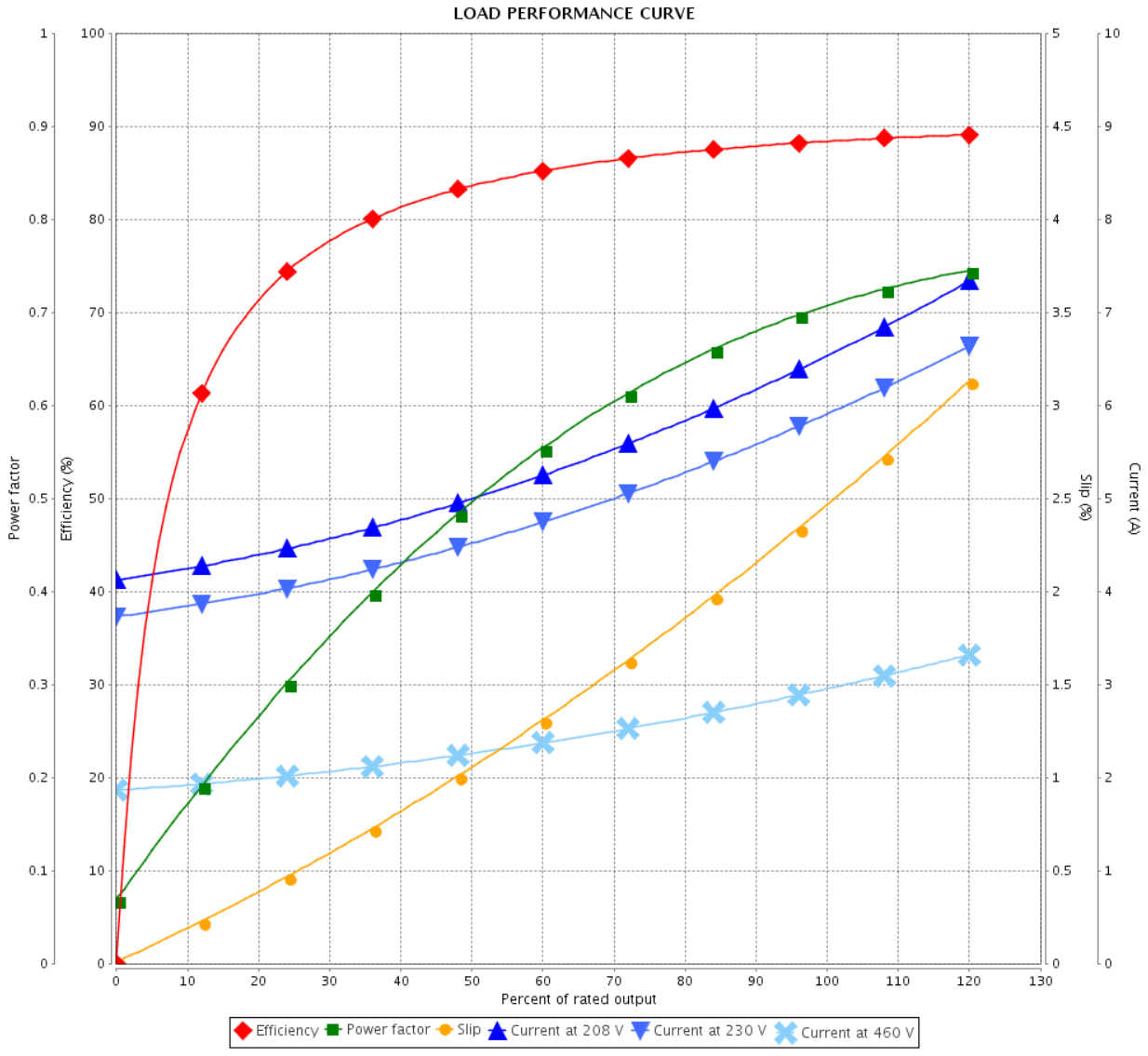

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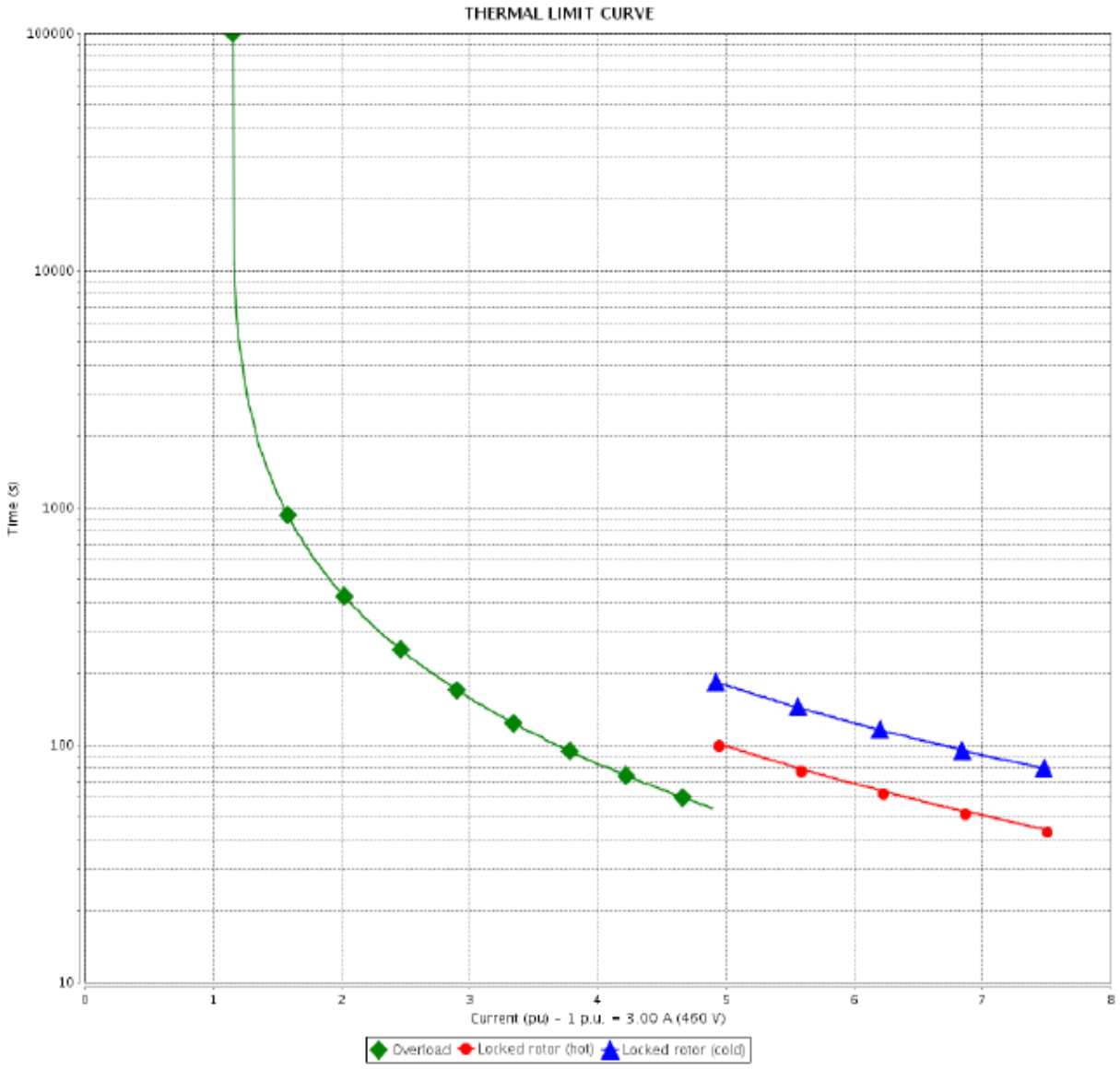
THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel NEMA Premium Efficiency Three-Phase	Product code :	12675385
		Catalog # :	00212ET3E184TC-S



Performance	: 230/460 V 60 Hz 6P

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Heating constant	
Cooling constant	

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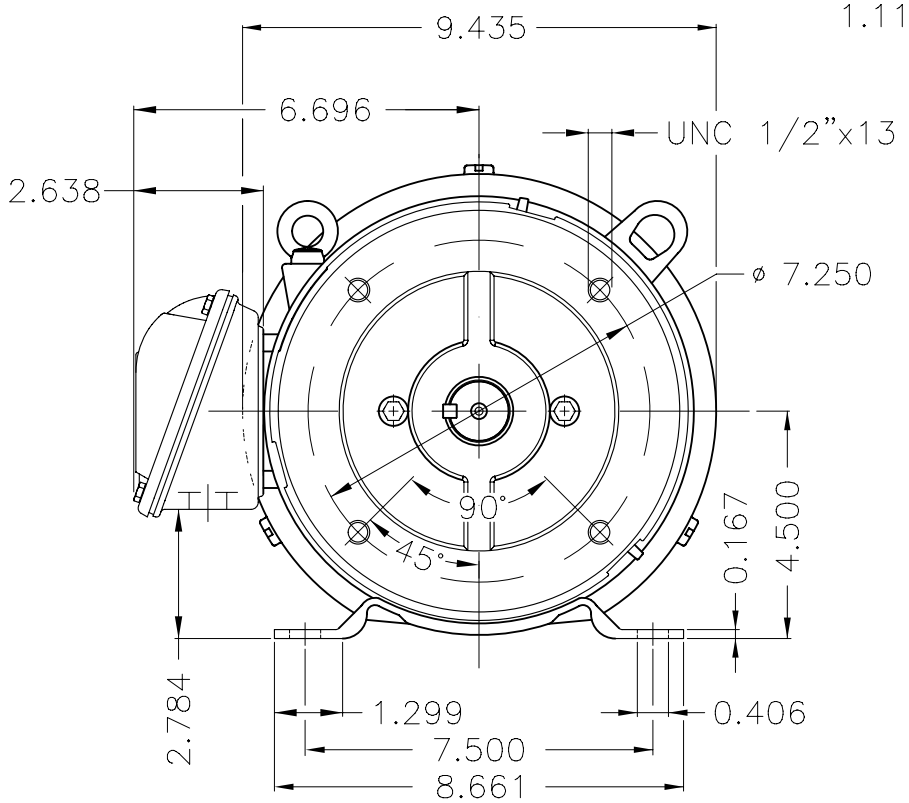
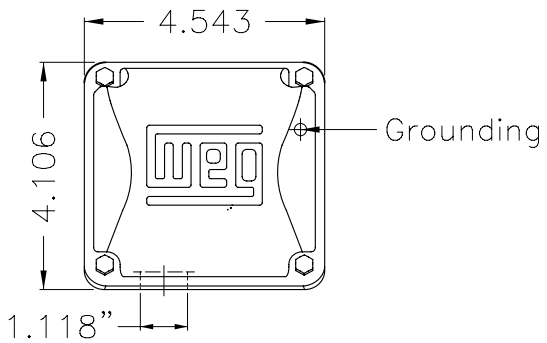
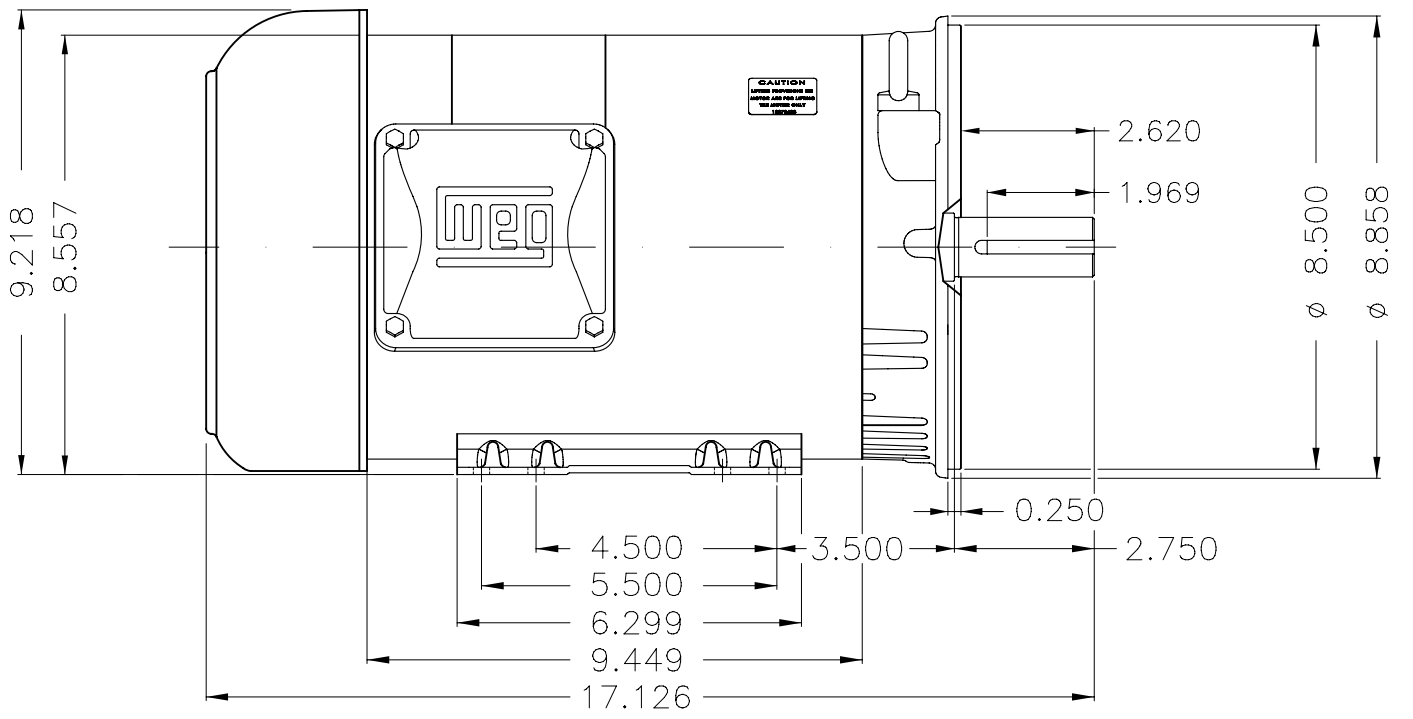
EIXO
PADRÃO X
OPCIONAL
ESPECIAL

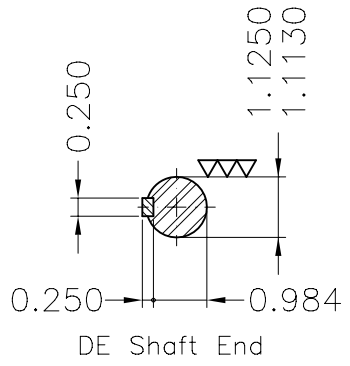
Dimensões em polegada
Dimensions in inches

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.









Color Munsell N 1 matte black
Painting plan 207N
Mounting F-1/B34R(D)

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER
EXECUTED	USERADMIN	THREE P. MOTOR CLOS ROLLED STEEL NEMA PREM					
CHECKED		FRAME 182/4TC IP55 TEFC					
RELEASED		WEG code: 12675385					
REL DT	13.04.2021	WMO Jaragua do Sul Product Engineering	SHEET 1 / 1				

2 HP 06 Poles 60Hz

A

ZME A3

NEMA Premium®

3PT9 C UL US LISTED FOR SAFE AREA

C SA US Energy Verified

MADE IN MÉXICO

MAT: 12675385 CC029A
W01.TE0IC0X0N
MODEL 00212ET3E184TC-S
04FEV2021 S/N:

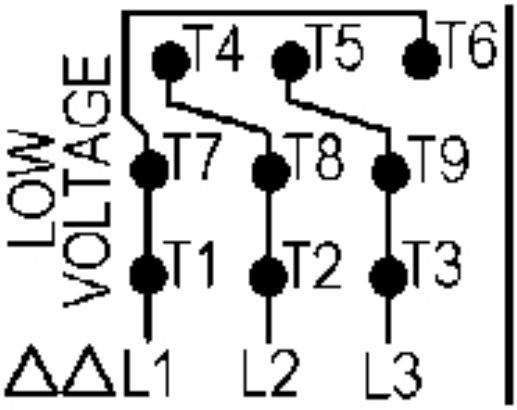
For 60Hz: Class I, Zone 2, IIC
Class I, Div.2, Gr. A,B,C,D - T3
Div 2 Inverter Duty (SF1.00)
CT 2:1/VT 1000:1

PH 3	Hz 60	HP	2.0
FR 182/4TC		kW	1.5
DUTY CONT.		V	230/460
ALT 1000 m.a.s.l		A	6.00/3.00
INS CL F ΔT 80K	IP55	SFA	6.90/3.45
AMB 40°C	DES B	SF	1.15
ENCL TEFC	CODE K	PF	0.71
USABLE @ 208V 6.63A SF1.00		RPM	1170
		NEMA NOM. EFF	88.5%

ALTERNATE RATING: 2.0HP 50Hz 190-220/380-415V SF1.15
7.00-6.43/3.50-3.41A 955RPM EFF 85.7% (IE3) IEC 60034-1

For safe area-Inverter duty motor For 60Hz use on VPWM 1000:1 VT, 4:1 CT

DE 6206-ZZ	ODE 6205-ZZ	MOBIL POLYREX EM	



T1-BLU T2-WHT
T3-ORG T4-YEL
T5-BLK T6-GRY
T7-PNK T8-RED
T9-BRK RED

INTERCHANGE ANY TWO LINE WIRES TO REVERSE THE ROTATION

WARNING: Motor must be grounded in accordance with local and national electrical codes to prevent serious electrical shocks. Disconnect power source before servicing unit.

AVERTISSEMENT: Le moteur doit être mis à la terre conformément aux codes électriques locaux et nationaux afin d'éviter tout choc électrique grave. Déconnectez l'alimentation avant l'entretien de la machine.

G26-XP

Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

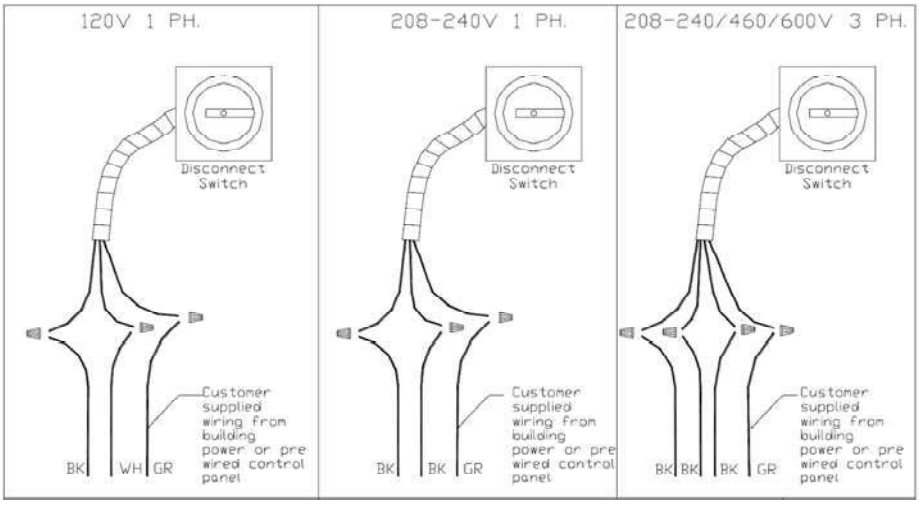
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14281643
		Catalog # :	00212XT3E184TC

Frame	: 182/4TC	Locked rotor time	: 63s (cold) 35s (hot)
Output	: 2 HP (1.5 kW)	Temperature rise	: 80 K
Poles	: 6	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 6.26/3.13 A	Protection degree	: IP55
L. R. Amperes	: 43.8/21.9 A	Cooling method	: IC411 - TEFC
LRC	: 7.0x(Code L)	Mounting	: F-1
No load current	: 4.20/2.10 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1165 rpm	Noise level[2]	: 52.0 dB(A)
Slip	: 2.92 %	Starting method	: Direct On Line
Rated torque	: 1.25 kgfm	Approx. weight[3]	: 62.0 kg
Locked rotor torque	: 260 %		
Breakdown torque	: 330 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 0.0224 kgm²		
Design	: B		

Output	25%	50%	75%	100%
Efficiency (%)	82.5	84.5	86.5	88.5
Power Factor	0.26	0.47	0.58	0.68

Foundation loads

Max. traction	: 57 kgf
Max. compression	: 119 kgf

		Drive end	Non drive end
Bearing type	:	6307 2RS	6206 2RS
Sealing	:	Oil Seal	Lip Seal
Lubrication interval	:	-	-
Lubricant amount	:	-	-
Lubricant type	:	Mobil Polyrex EM	

Notes
USABLE @208V 6.92A SF 1.15 SFA 7.96A

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	13/04/2021		1 / 6	

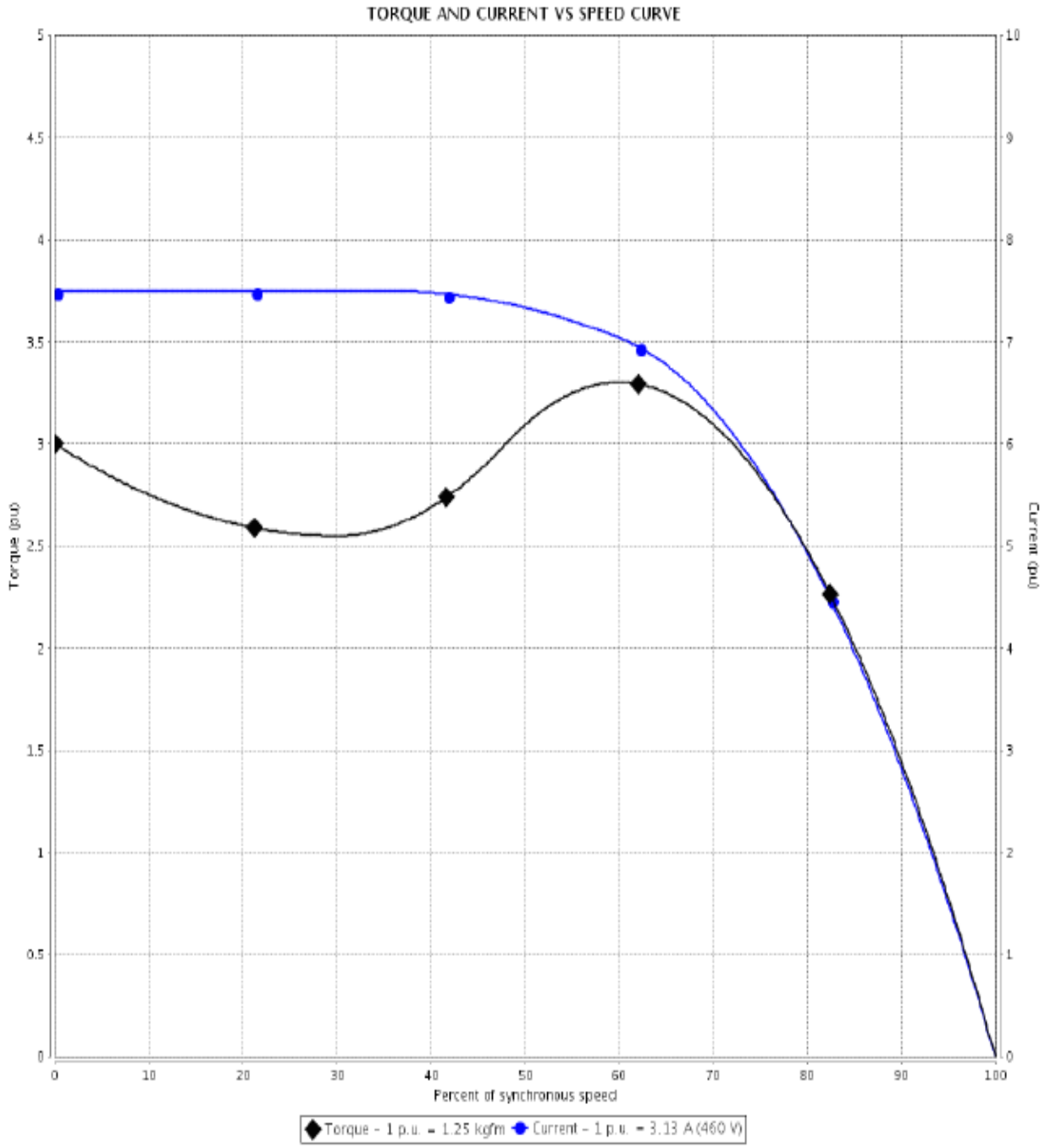
DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer :

Thermal protection

ID	Application	Type	Quantity	Sensing Temperature
1	Winding	Thermostat - 2 wires	1 x Phase	155 ºC



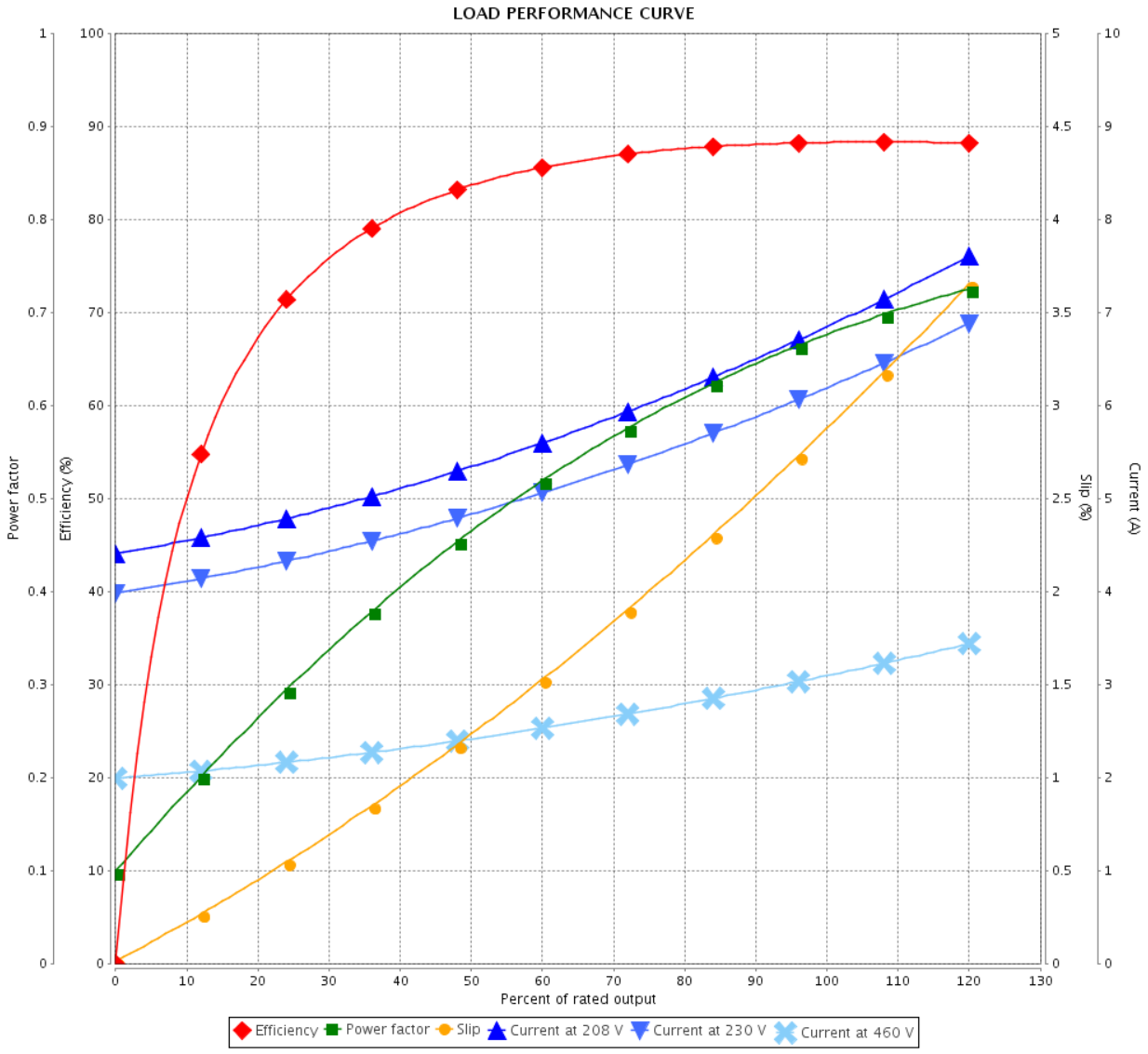
Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	13/04/2021		2 / 6	

LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:		
Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14281643
		Catalog # :	00212XT3E184TC



Performance	: 230/460 V 60 Hz 6P		
Rated current	: 6.26/3.13 A	Moment of inertia (J)	: 0.0224 kgm²
LRC	: 7.0	Duty cycle	: Cont.(S1)
Rated torque	: 1.25 kgfm	Insulation class	: F
Locked rotor torque	: 260 %	Service factor	: 1.15
Breakdown torque	: 330 %	Temperature rise	: 80 K
Rated speed	: 1165 rpm	Design	: B

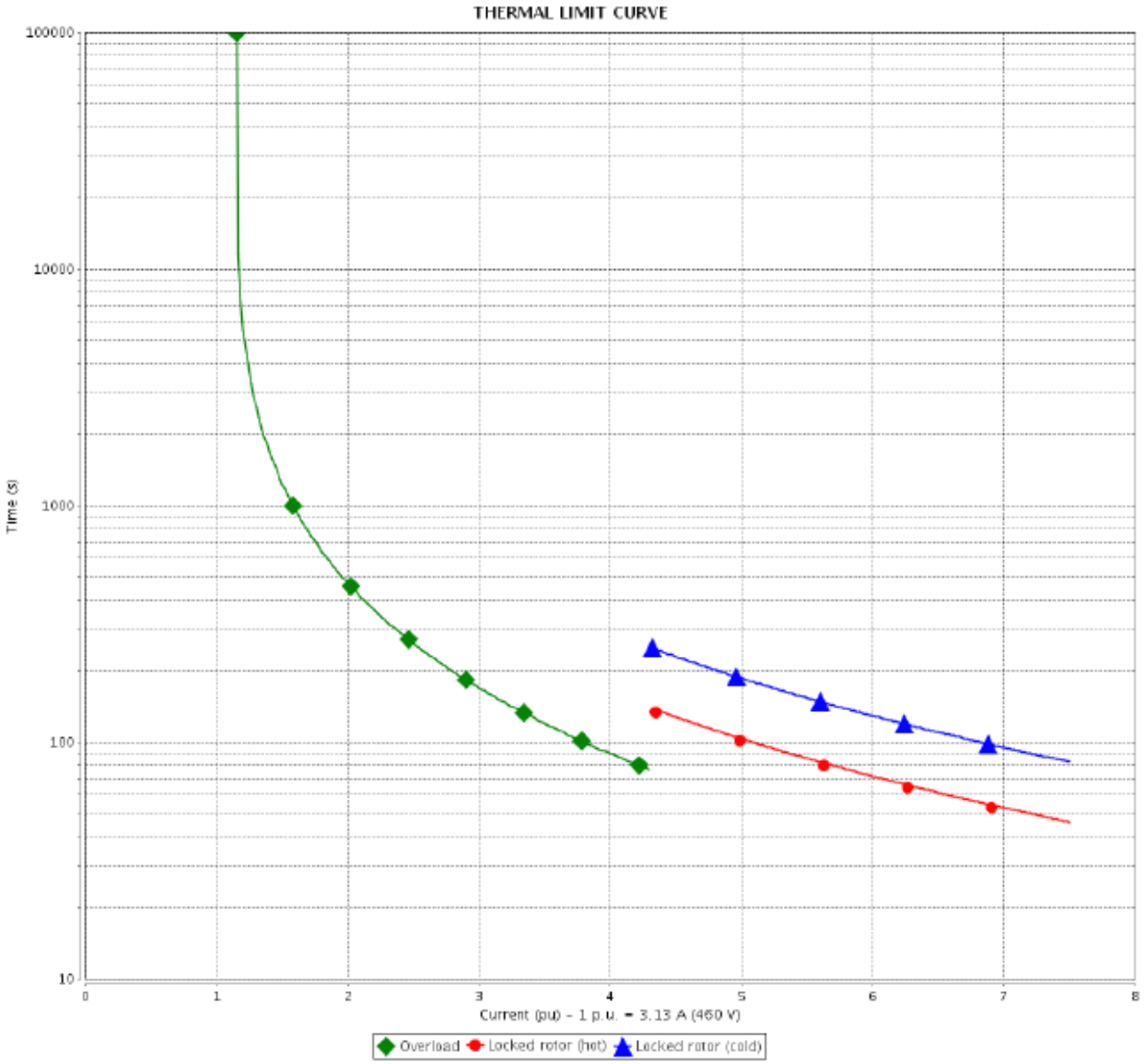
Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	13/04/2021		4 / 6	

THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:		
Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14281643
		Catalog # :	00212XT3E184TC



Performance	: 230/460 V 60 Hz 6P		
Rated current	: 6.26/3.13 A	Moment of inertia (J)	: 0.0224 kgm²
LRC	: 7.0	Duty cycle	: Cont.(S1)
Rated torque	: 1.25 kgfm	Insulation class	: F
Locked rotor torque	: 260 %	Service factor	: 1.15
Breakdown torque	: 330 %	Temperature rise	: 80 K
Rated speed	: 1165 rpm	Design	: B
Heating constant			
Cooling constant			

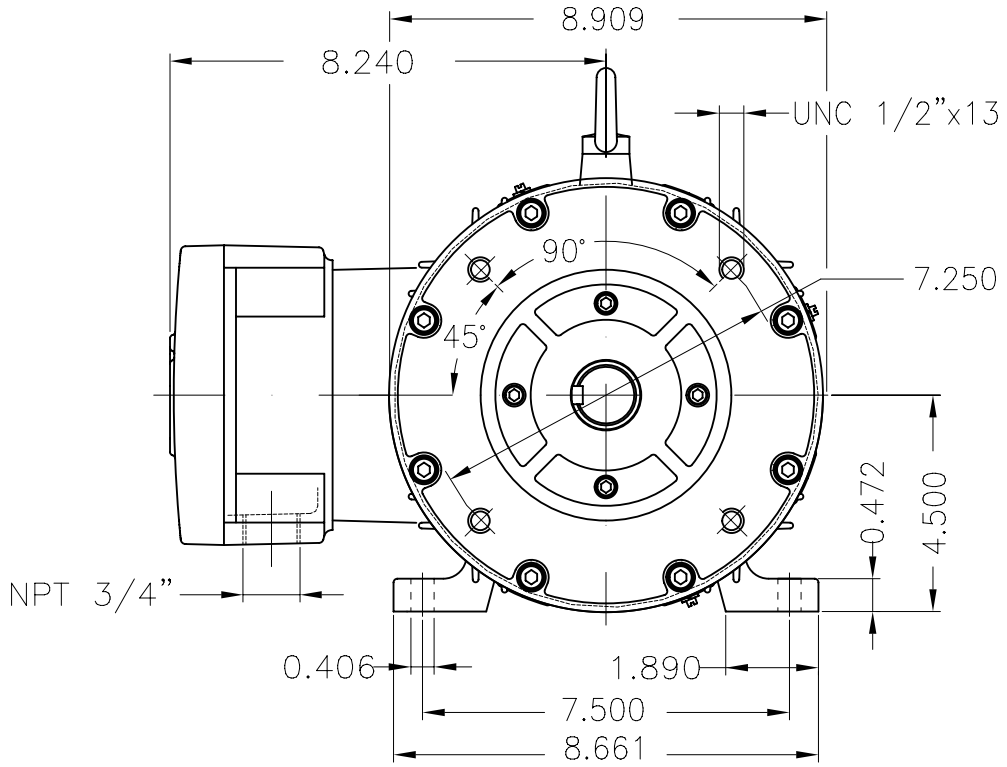
Rev.	Changes Summary	Performed	Checked	Date

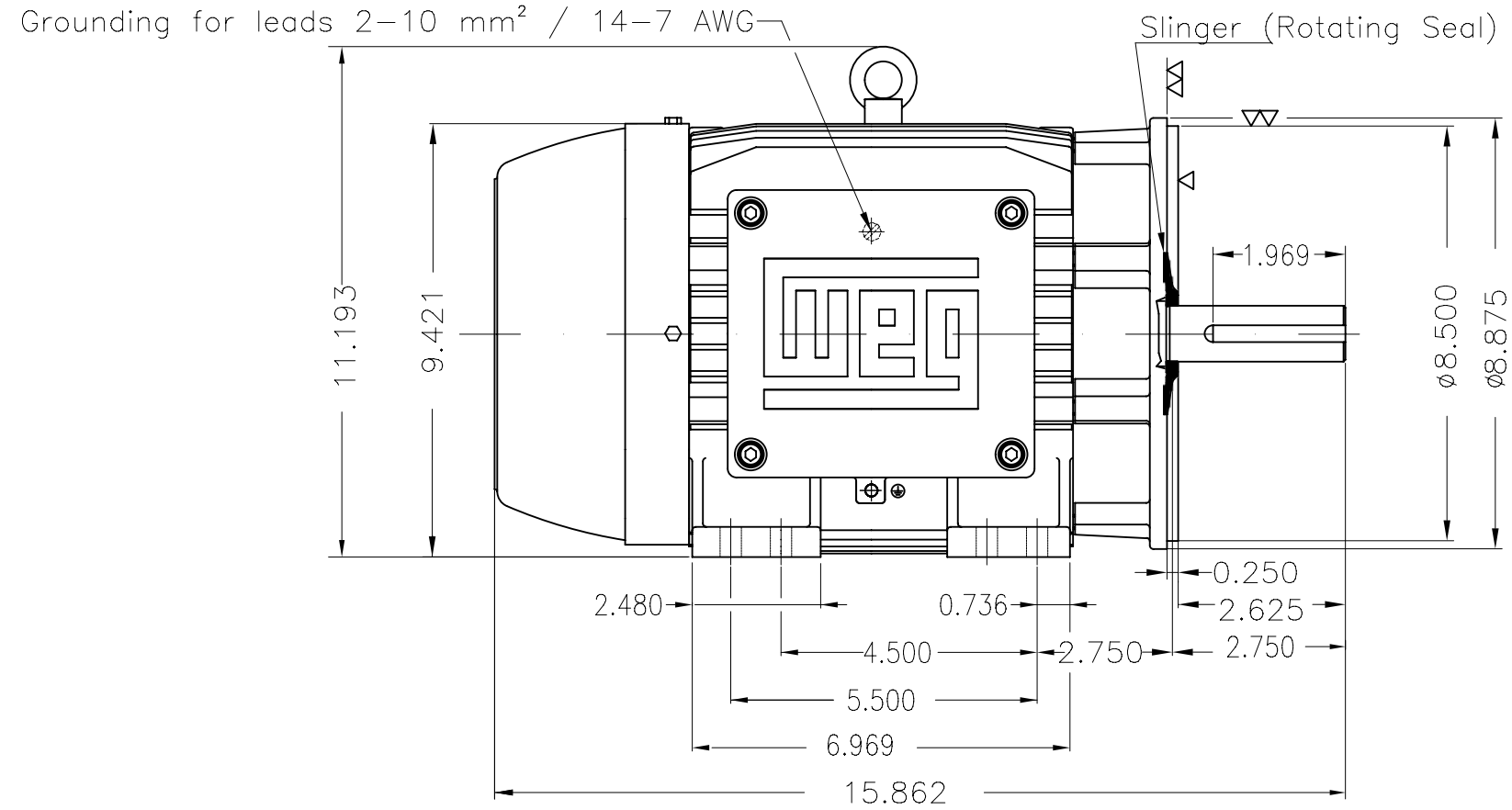
Performed by				
Checked by			Page	Revision
Date	13/04/2021		5 / 6	

EIXO	
PADRÃO	X
OPCIONAL	
ESPECIAL	

Dimensões em polegada
Dimensions in inches

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.





Color RAL 5009
Painting plan 202P
Mounting B34R(D)

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER

EXECUTED	USERADMIN	THREE-PHASE EXPLOSION PROOF MOTOR		
CHECKED		FRAME 182/4TC IP55 TEFC		
RELEASED		WEG code: 14281643		
REL DT	13.04.2021	WMO Jaragua do Sul Product Engineering	SHEET 1 / 1	

2 HP 06 Poles 60Hz

A3 ZME

MADE IN BRAZIL

W21X NEMA Premium®

14281643

CC029A
Inverter Duty Motor
Severe Duty

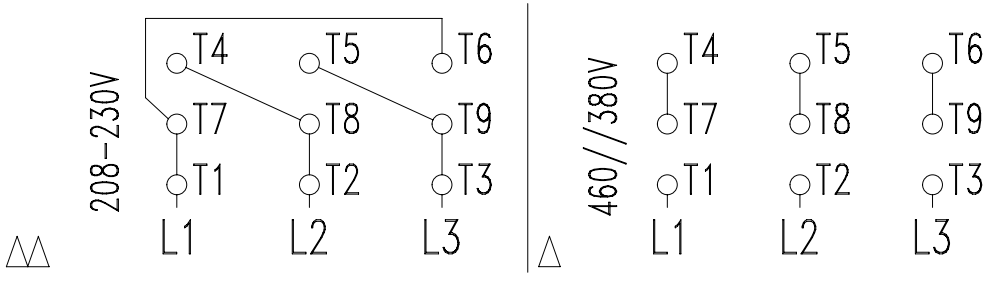
UL LISTED

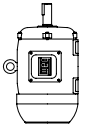
MODEL 00212XT3E184TC

PH 3	FR 182/4TC	
HP(kW) 2.0(1.5)	HZ 60	IP55
V 230/460	A 6.26/3.13	
RPM 1165	NEMA NOM EFF 88.5%	
PF 0.68	SFA 7.20/3.60	DES B
INS CL F △T 80 K	SF 1.15	ENCL TEFC
DUTY CONT.	CODE K	ALT 1000 m.a.s.l.
AMB 40°C	USABLE @208V 6.92 A	SF 1.15 SFA 7.96

AMB 55°C SF1.0

2.0HP 1.5kW 50Hz 380V 3.66A 950RPM SF1.00 EFF 86.5% (IE4)





→ 6307-2RS MOBIL POLYREX EM

→ 6206-2RS

134 Lbs

C SA® US
Energy Verified

TEMP CODE T3C
CSA/UL: Class I – Div. 1 – Groups C and D
CSA: Class II – Div. 1 – Groups F and G
CSA: Class I – Zone 1 – IIB
EXPLOSION PROOF MOTOR

FOR USE ON VPWM VFD 1000:1VT, 20:1CT, 1.0SF, T3C, AMB 40°C.

G30

Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

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This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
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3. The equipment is misused or neglected,
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INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

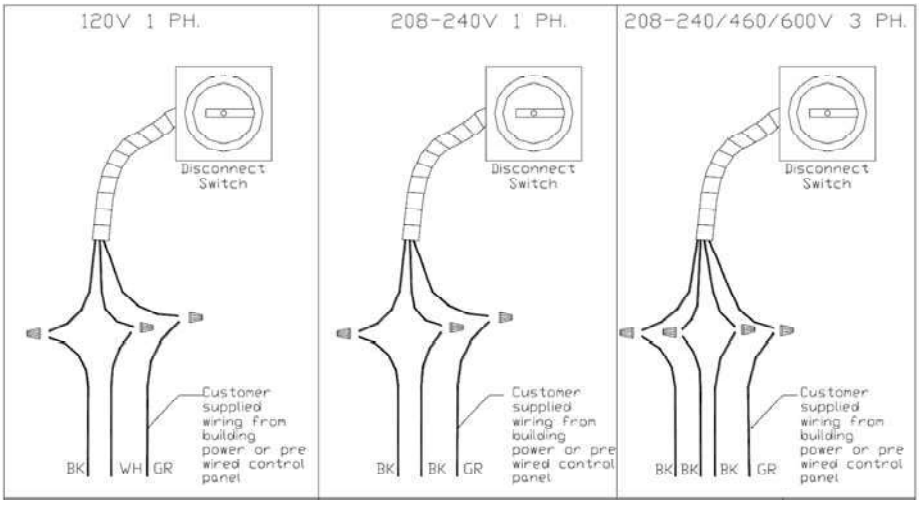
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel NEMA Premium Efficiency Three-Phase	Product code :	12675389
		Catalog # :	00512ET3E215TC-S

Frame	: 213/5TC	Locked rotor time	: 54s (cold) 30s (hot)
Output	: 5 HP (3.7 kW)	Temperature rise	: 80 K
Poles	: 6	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 13.5/6.74 A	Protection degree	: IP55
L. R. Amperes	: 80.9/40.4 A	Cooling method	: IC411 - TEFC
LRC	: 6.0x(Code H)	Mounting	: F-1
No load current	: 6.84/3.42 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1175 rpm	Noise level[2]	: 55.0 dB(A)
Slip	: 2.08 %	Starting method	: Direct On Line
Rated torque	: 22.3 ft.lb	Approx. weight[3]	: 155 lb
Locked rotor torque	: 220 %		
Breakdown torque	: 250 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 1.26 sq.ft.lb		
Design	: B		

Output	25%	50%	75%	100%
Efficiency (%)	86.4	87.5	88.5	89.5
Power Factor	0.35	0.59	0.71	0.77

Foundation loads

Max. traction	: 245 lb
Max. compression	: 400 lb

		Drive end	Non drive end
Bearing type	:	6208 ZZ	6206 ZZ
Sealing	:	V'Ring	Without Bearing Seal
Lubrication interval	:	-	-
Lubricant amount	:	-	-
Lubricant type	:	Mobil Polyrex EM	

Notes
USABLE @208V 14.9A SF 1.00 SFA 14.9A

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
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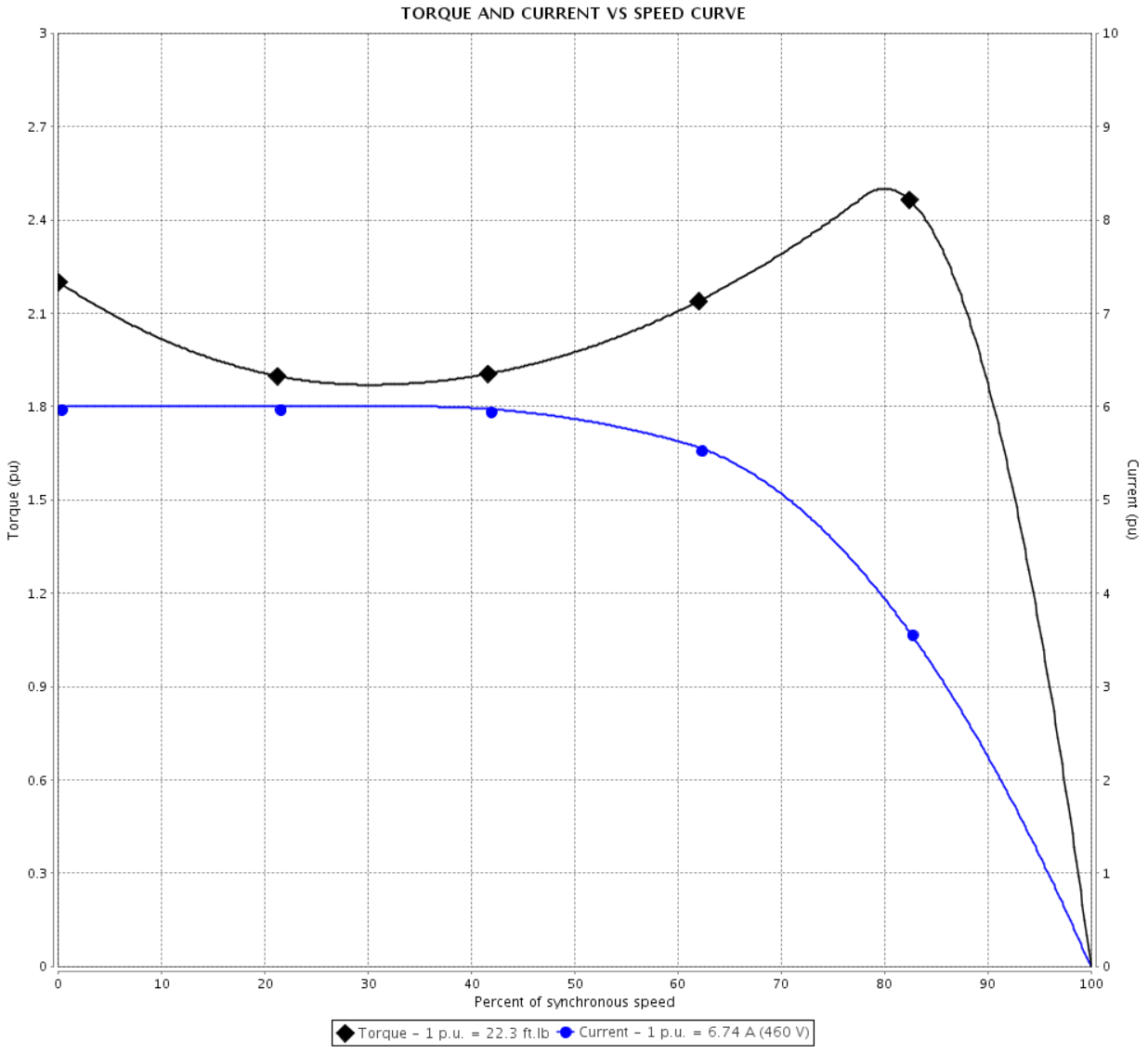
TORQUE AND CURRENT VS SPEED CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel NEMA Premium Efficiency Three-Phase	Product code :	12675389
		Catalog # :	00512ET3E215TC-S



Performance	: 230/460 V 60 Hz 6P

Rated current	: 13.5/6.74 A	Moment of inertia (J)	: 1.26 sq.ft.lb
LRC	: 6.0	Duty cycle	: Cont.(S1)
Rated torque	: 22.3 ft.lb	Insulation class	: F
Locked rotor torque	: 220 %	Service factor	: 1.15
Breakdown torque	: 250 %	Temperature rise	: 80 K
Rated speed	: 1175 rpm	Design	: B

Locked rotor time	: 54s (cold) 30s (hot)

Rev.	Changes Summary	Performed	Checked	Date

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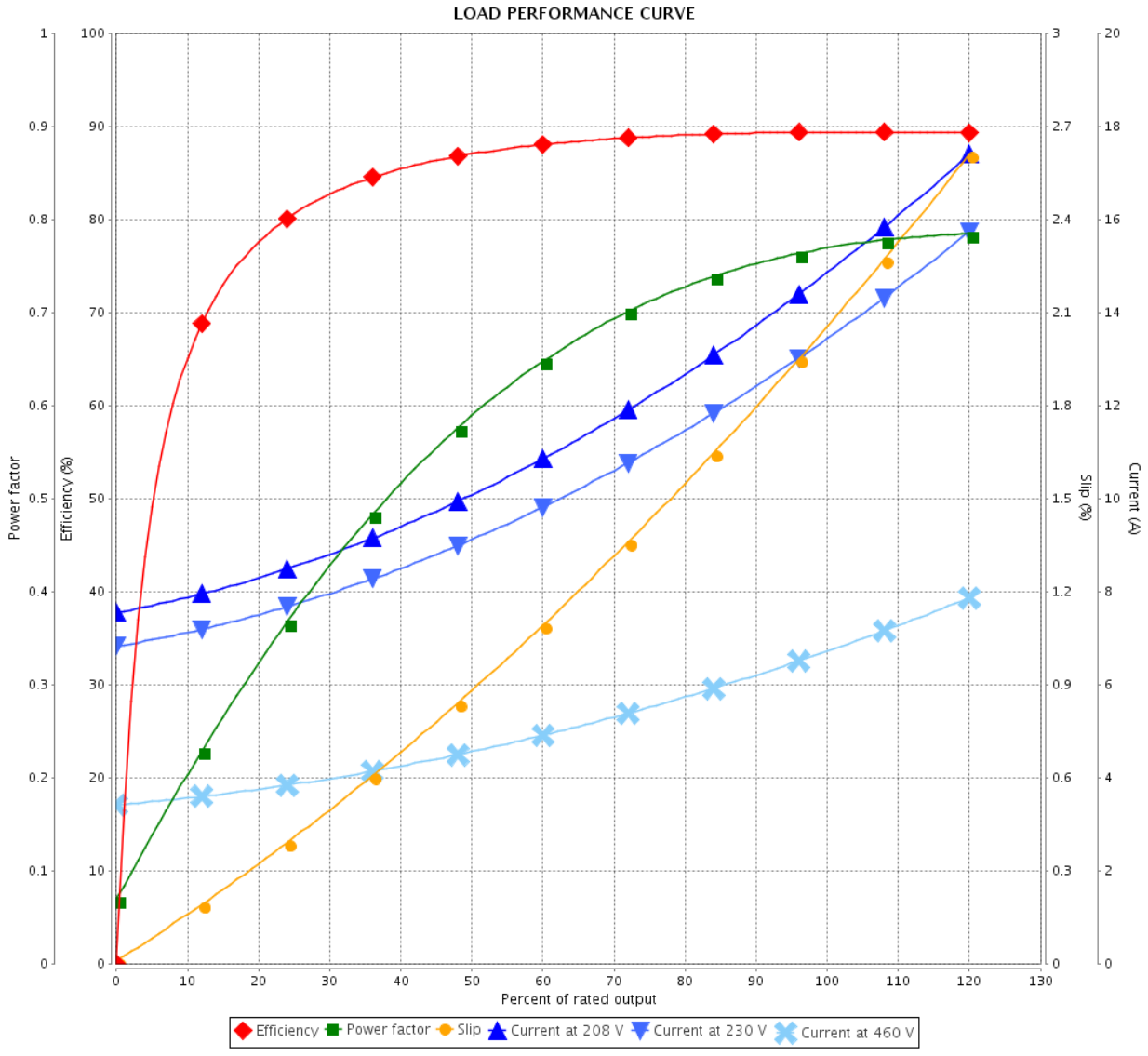
LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:		
Product line	: Rolled Steel NEMA Premium Efficiency Three-Phase	Product code :	12675389
		Catalog # :	00512ET3E215TC-S



Performance	: 230/460 V 60 Hz 6P		
Rated current	: 13.5/6.74 A	Moment of inertia (J)	: 1.26 sq.ft.lb
LRC	: 6.0	Duty cycle	: Cont.(S1)
Rated torque	: 22.3 ft.lb	Insulation class	: F
Locked rotor torque	: 220 %	Service factor	: 1.15
Breakdown torque	: 250 %	Temperature rise	: 80 K
Rated speed	: 1175 rpm	Design	: B

Rev.	Changes Summary	Performed	Checked	Date

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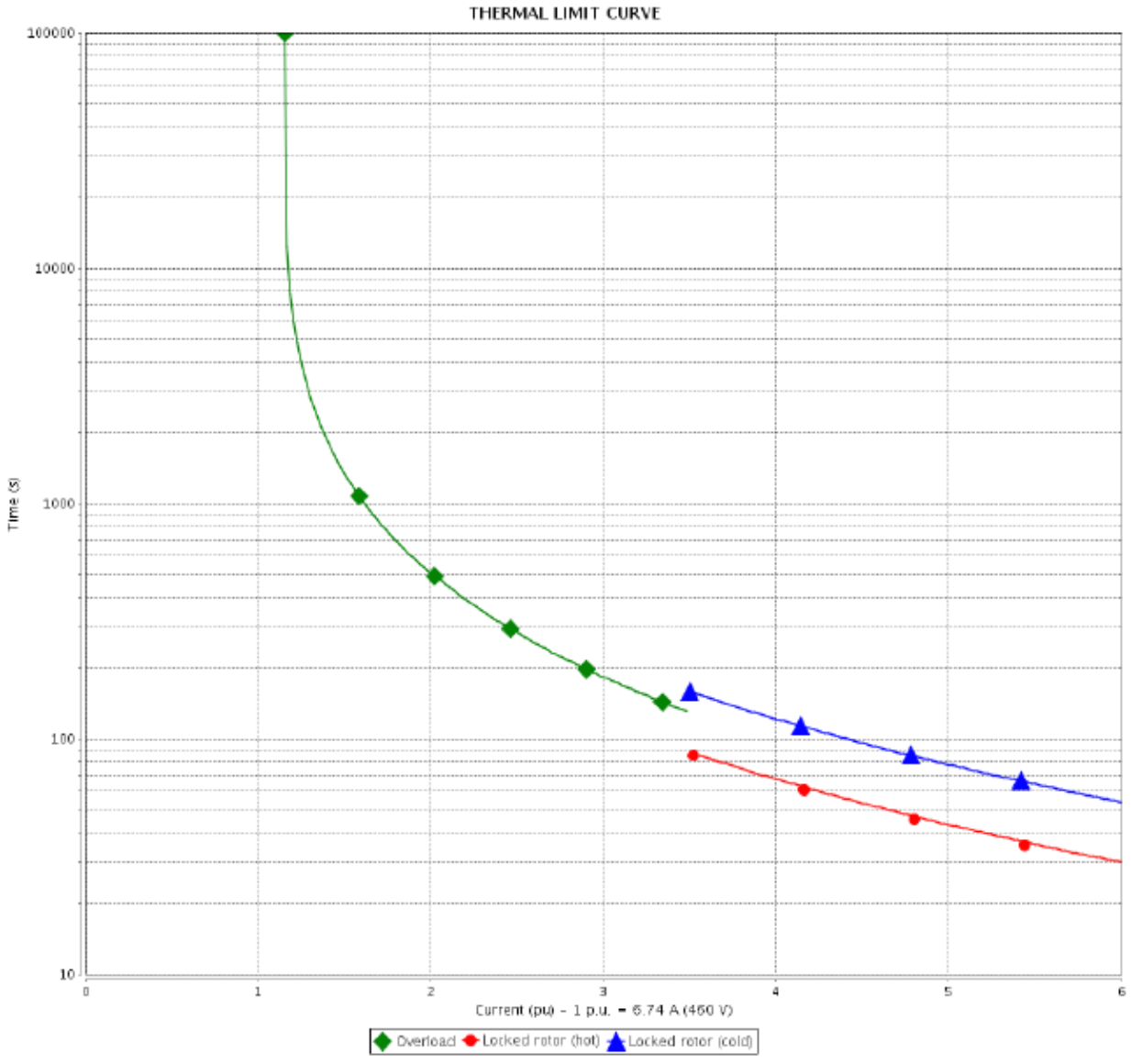
THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: Rolled Steel NEMA Premium Efficiency Three-Phase	Product code :	12675389
		Catalog # :	00512ET3E215TC-S



Performance	: 230/460 V 60 Hz 6P

Rated current	: 13.5/6.74 A	Moment of inertia (J)	: 1.26 sq.ft.lb
LRC	: 6.0	Duty cycle	: Cont.(S1)
Rated torque	: 22.3 ft.lb	Insulation class	: F
Locked rotor torque	: 220 %	Service factor	: 1.15
Breakdown torque	: 250 %	Temperature rise	: 80 K
Rated speed	: 1175 rpm	Design	: B

Heating constant	
Cooling constant	

Rev.	Changes Summary	Performed	Checked	Date

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Checked by			Page	Revision
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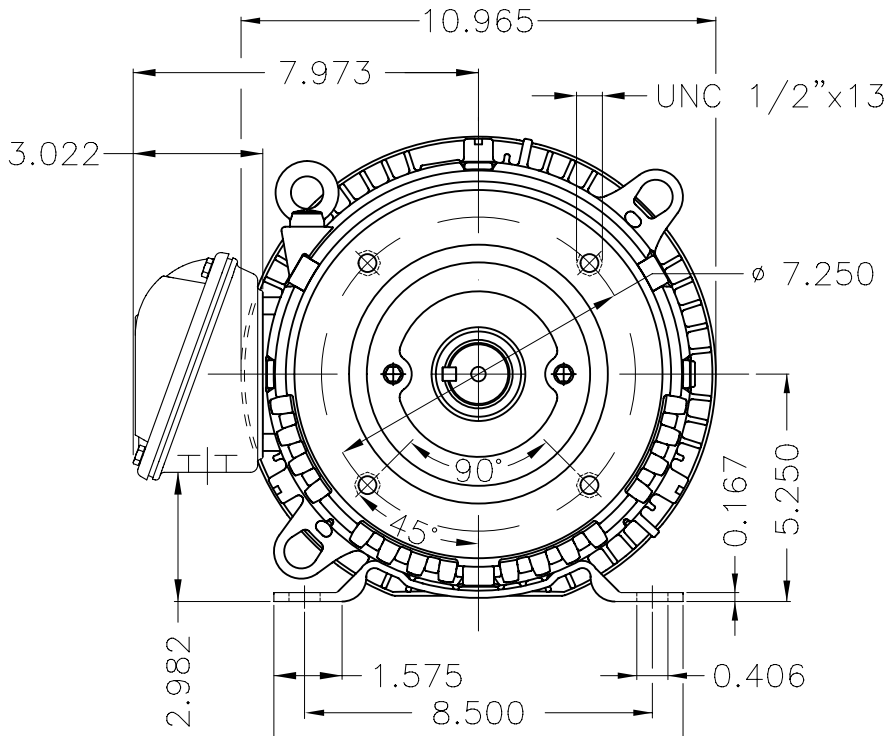
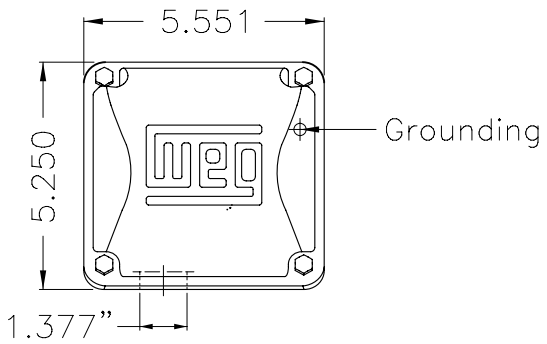
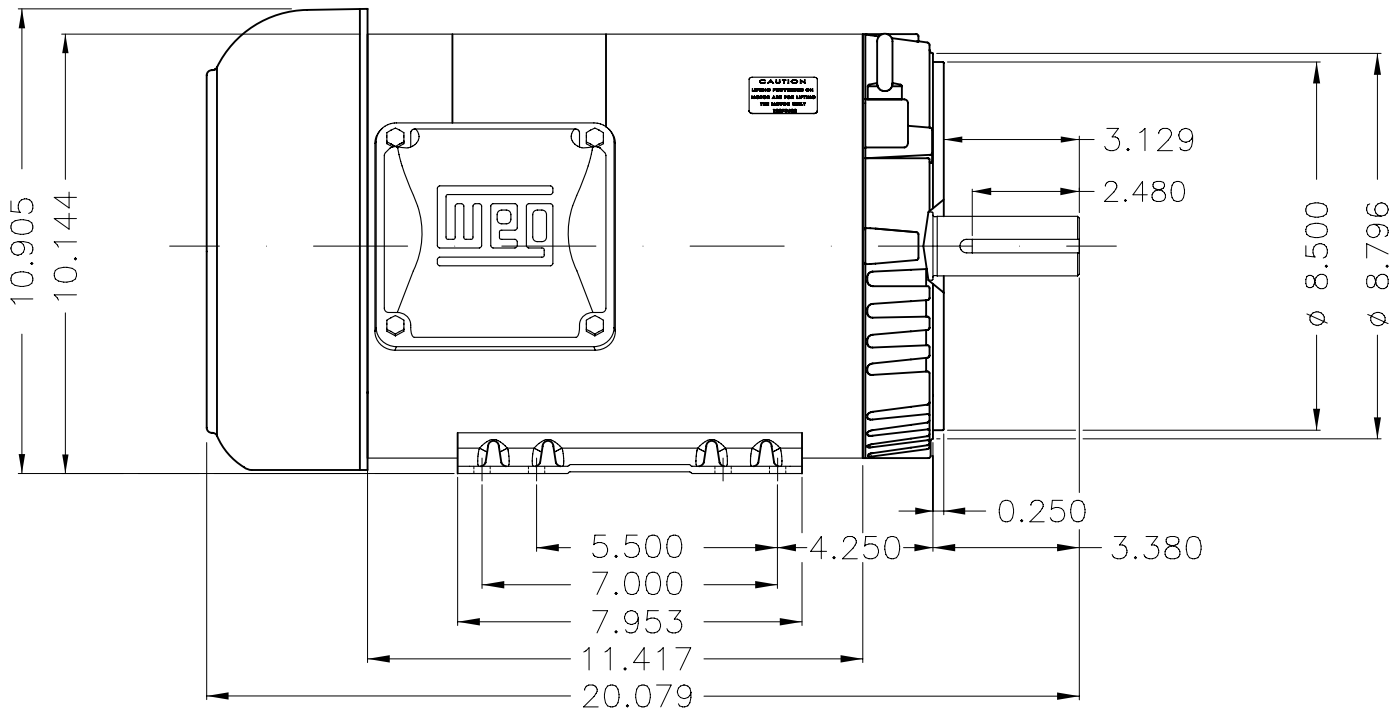
EIXO
PADRÃO X
OPCIONAL
ESPECIAL

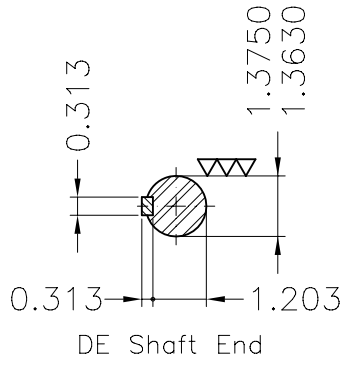
Dimensões em polegada
Dimensions in inches

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.









Color Munsell N 1 matte black
Painting plan 207N
Mounting F-1/B34R(D)

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER

EXECUTED	USERADMIN	THREE P. MOTOR CLOS ROLLED STEEL NEMA PREM	
CHECKED		FRAME 213/5TC IP55 TEFC	
RELEASED		WEG code: 12675389	
REL DT	13.04.2021	WMO Jaragua do Sul Product Engineering	SHEET 1 / 1

5 HP 06 Poles 60Hz

A

ZME A3

NEMA Premium®

3PT9 c UL us LISTED FOR SAFE AREA

c CSA us Energy Verified

MADE IN MÉXICO

MAT: 12675389 CC029A
W01.TE0IC0X0N
MODEL 00512ET3E215TC-S

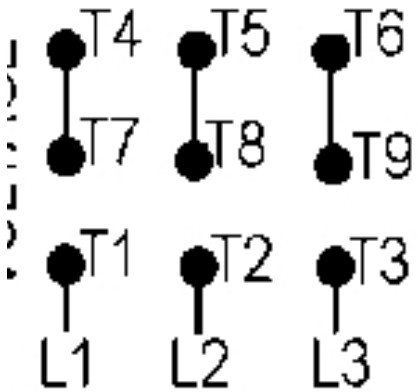
For 60Hz: Class I, Zone 2, IIC
Class I, Div.2, Gr. A,B,C,D - T3
Div 2 Inverter Duty (SF1.00)
CT 2:1/VT 1000:1

HP	5.0
kW	3.7
V	230/460
A	13.5/6.74
SFA	15.5/7.75
SF	1.15
PF	0.77
RPM	1175
NEMA NOM. EFF	89.5%

0Hz	190-220/380-415V	SF1.00
0RPM	EFF 85.4% (IE2)	IEC 60034-1

or For 60Hz use on VPWM 1000:1 VT, 4:1 CT

MOBIL POLYREX EM

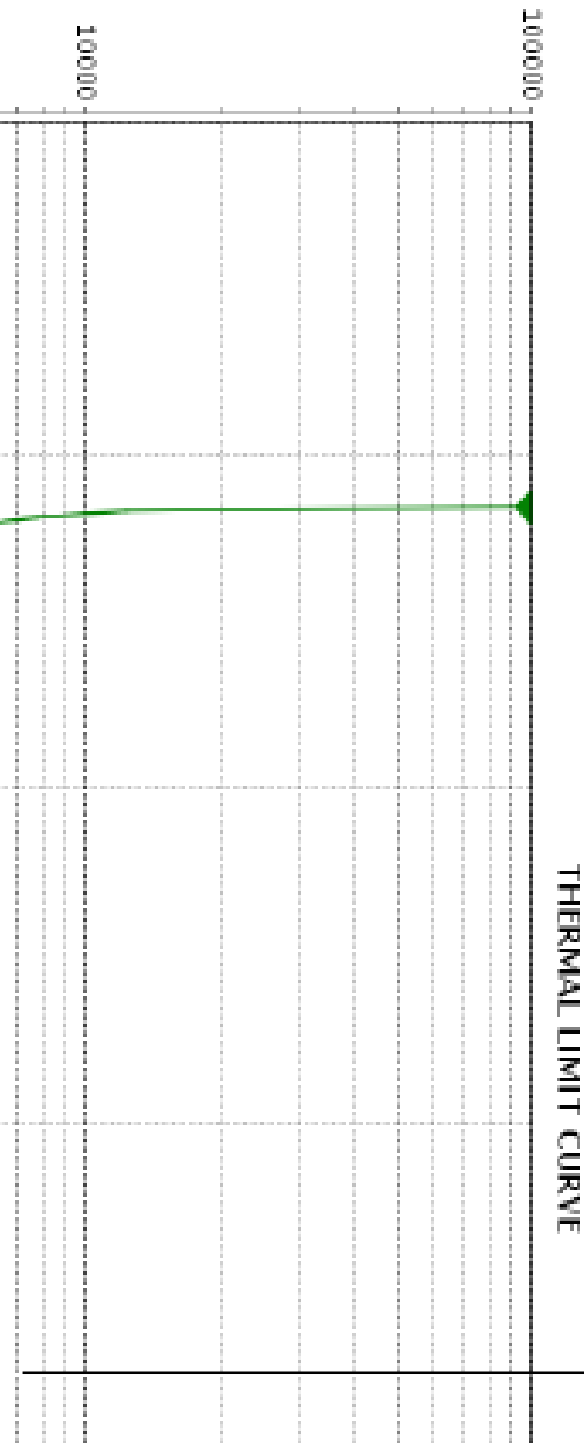


T1-BLU T2-WHT
T3-ORG T4-YEL
T5-BLK T6-GRY
T7-PNK T8-RED
T9-BRK RED

S TO REVERSE THE ROTATION

nded in accordance with local
s to prevent serious electrical
source before servicing unit.

moteur doit être mis à la terre
ux et nationaux afin d'éviter tout
ntation avant l'entretien de la machine.



G30-XP

Power Roof Ventilator/Fans
Installation, Operation, and Maintenance Manual

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Installation of this ventilator should only be performed by a qualified professional who has read and understands these instructions and is familiar with proper safety precautions. Improper installation poses serious risk of injury due to electric shock, contact with rotating equipment, and other potential hazards. Read this manual thoroughly before installing or servicing this equipment. ALWAYS disconnect power prior to working on fan.

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at 1-800-828-0282 for warranty and technical support issues.

Mechanical

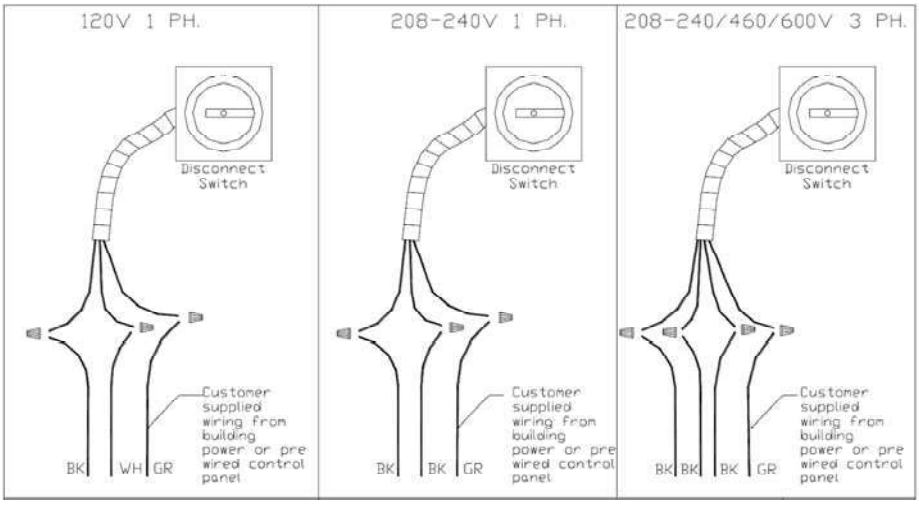
WARNING: DO NOT RAISE VENTILATOR BY THE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. The fan discharge must be located at least 10 feet away from any supply intakes. The fan discharge shall be located in accordance with the applicable building code provisions.

Roof Mounting

1. Ventilators are designed for installation atop a prefabricated or factory built roof curb. Follow manufacturer's instructions for proper curb installation.
2. Before connecting fan motor to power source verify power line wiring is de-energized.
3. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Make certain that the power source is compatible with the requirements of your equipment.
4. Before powering up fan check ventilator wheel for free rotation.
5. Check all fasteners for tightness.
6. Re-install motor dome.



OPERATION

Prior to starting up or operating the ventilator, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power to the fan OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Amperage Meter
- Standard Hand Tools

Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Inspect the air-stream for obstructions or debris in wheel.
3. Compare the supplied voltage with the fan's nameplate voltage. If this does not match, correct the problem.
4. Start the fan up, by turning the external disconnect to the ON position, and shut it OFF immediately to check rotation of the wheel with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
5. When the fan is started up, observe the operation and check for any unusual noises.
6. Switch the external disconnect back to the ON position and with the air system in full operation and all ducts attached, measure the system airflow.
7. Measure and record the voltage and amperage to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.

Troubleshooting

The following table lists causes and corrective actions for possible problems with the fan units. Review this list prior to consulting manufacturer.

Troubleshooting Chart

Problem Potential Cause Corrective Action

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in "Off" position	Turn to "On" position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Motor starter overloaded	Reset starter and check amps
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor inlet/outlet conditions	There should be a straight clear duct at the inlet/outlet
	Damper not fully open	Inspect damper linkage and replace damper motor if needed
Excessive Vibration and Noise	Damaged or unbalanced wheel	Replace wheel
	Bearings need lubrication or replacement	Lubricate or replace

MAINTENANCE

To guarantee trouble free operation of this fan, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance. Please record any maintenance or service performed.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE FAN UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED

General Maintenance

1. Fan discharge and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. Bearings should be lubricated every 2 months. Caution: Bearings are sealed and over-greasing bearings can cause damage to the bearings. Do not grease until grease comes out of seals. Only add the appropriate amount of grease.
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Fans require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.


LEESON

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14296347
		Catalog # :	00512XT3E215TC

Frame	: 213/5TC	Locked rotor time	: 102s (cold) 57s (hot)
Output	: 5 HP (3.7 kW)	Temperature rise	: 80 K
Poles	: 6	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 13.7/6.83 A	Protection degree	: IP55
L. R. Amperes	: 92.9/46.4 A	Cooling method	: IC411 - TEFC
LRC	: 6.8x(Code J)	Mounting	: F-1
No load current	: 6.90/3.45 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1170 rpm	Noise level[2]	: 55.0 dB(A)
Slip	: 2.50 %	Starting method	: Direct On Line
Rated torque	: 3.10 kgfm	Approx. weight[3]	: 99.2 kg
Locked rotor torque	: 170 %		
Breakdown torque	: 260 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 0.0620 kgm²		
Design	: B		

Output	25%	50%	75%	100%
Efficiency (%)	88.2	88.5	89.5	89.5
Power Factor	0.34	0.58	0.70	0.76

Foundation loads

Max. traction	: 123 kgf
Max. compression	: 222 kgf

		Drive end	Non drive end
Bearing type	:	6308 2RS	6207 2RS
Sealing	:	Oil Seal	Lip Seal
Lubrication interval	:	-	-
Lubricant amount	:	-	-
Lubricant type	:	Mobil Polyrex EM	

Notes
USABLE @208V 15.1A SF 1.15 SFA 17.4A

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

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Customer :

Thermal protection

ID	Application	Type	Quantity	Sensing Temperature
1	Winding	Thermostat - 2 wires	1 x Phase	155 ºC

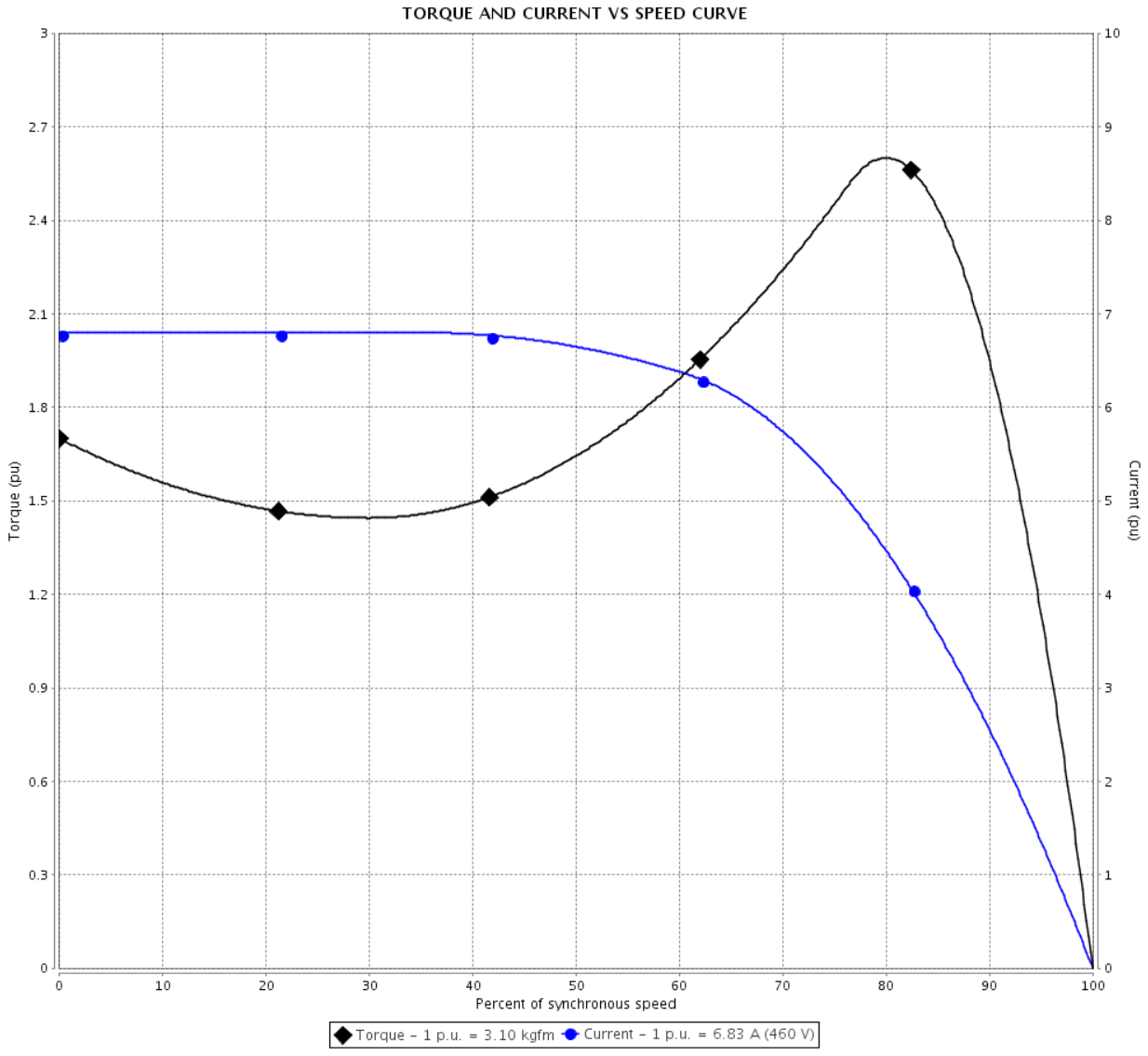
Rev.	Changes Summary	Performed	Checked	Date

TORQUE AND CURRENT VS SPEED CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14296347
		Catalog # :	00512XT3E215TC



Performance	: 230/460 V 60 Hz 6P

Rated current	: 13.7/6.83 A	Moment of inertia (J)	: 0.0620 kgm²
LRC	: 6.8	Duty cycle	: Cont.(S1)
Rated torque	: 3.10 kgfm	Insulation class	: F
Locked rotor torque	: 170 %	Service factor	: 1.15
Breakdown torque	: 260 %	Temperature rise	: 80 K
Rated speed	: 1170 rpm	Design	: B

Locked rotor time	: 102s (cold) 57s (hot)

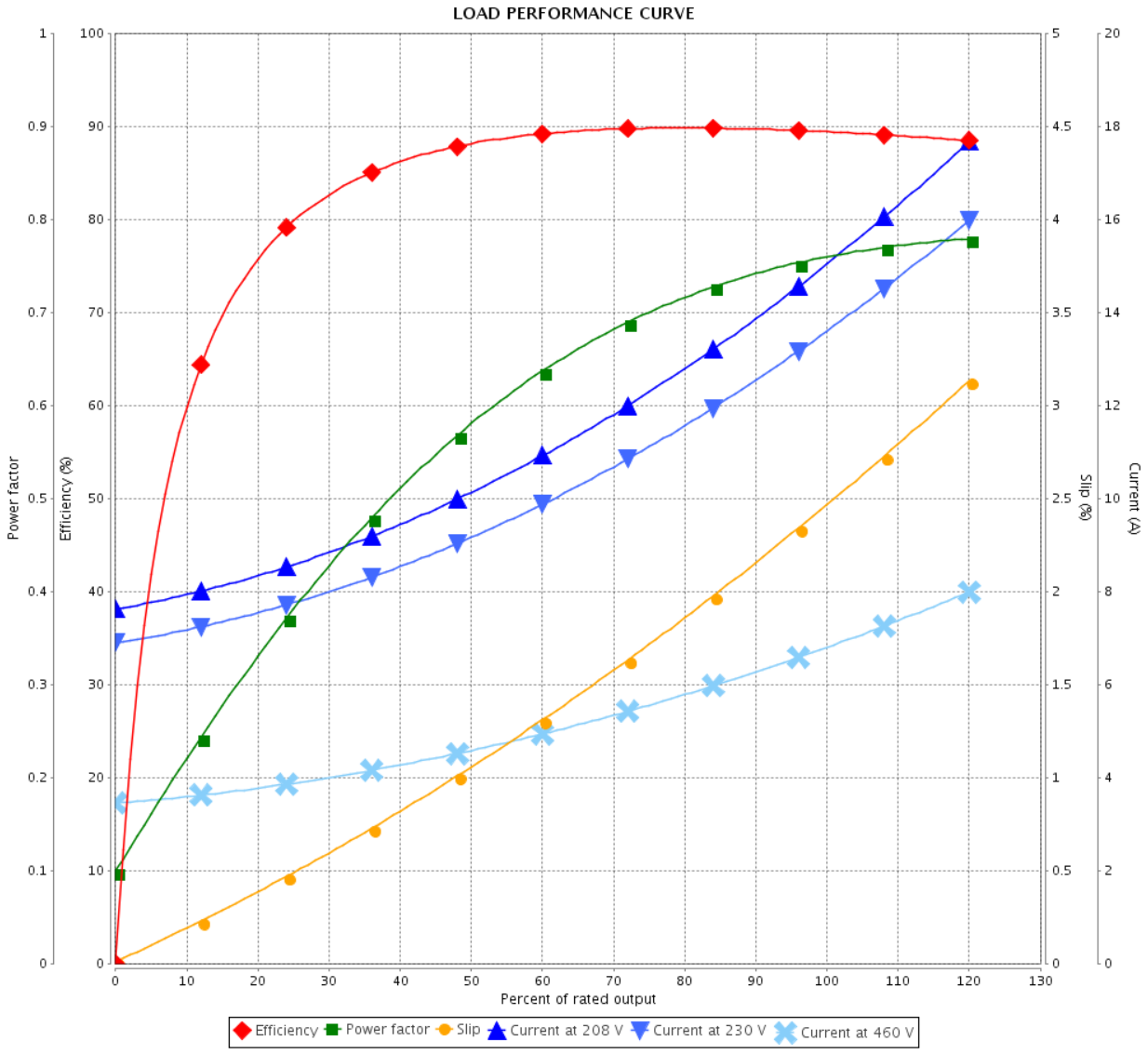
Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	13/04/2021		3 / 6	

LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:		
Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14296347
		Catalog # :	00512XT3E215TC



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Breakdown torque	: 260 %	Temperature rise	: 80 K
Rated speed	: 1170 rpm	Design	: B

Rev.	Changes Summary	Performed	Checked	Date

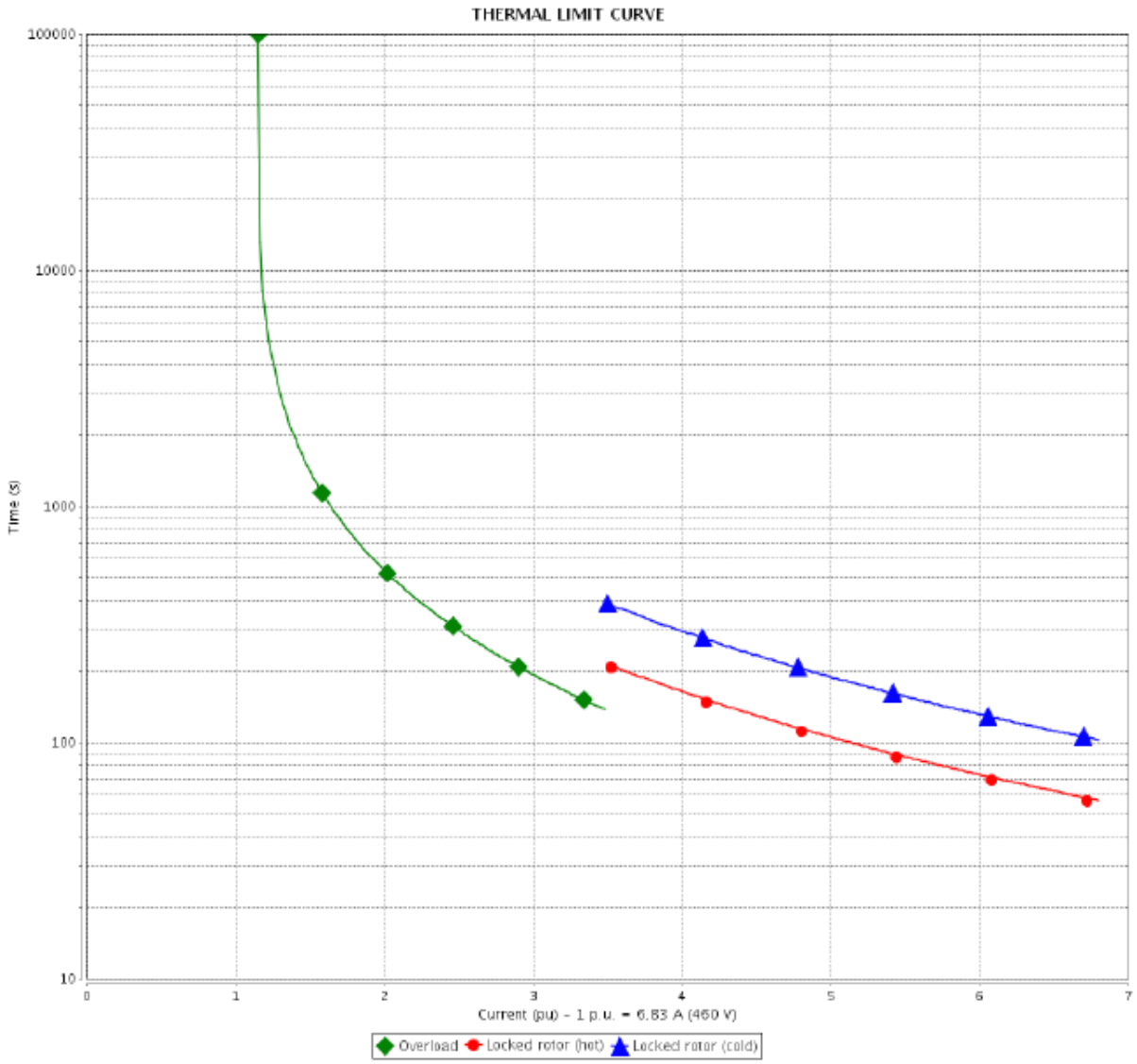
Performed by				
Checked by			Page	Revision
Date	13/04/2021		4 / 6	

THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W21 Explosion-proof Motor NEMA Premium Efficiency Three-Phase	Product code :	14296347
		Catalog # :	00512XT3E215TC



Performance	: 230/460 V 60 Hz 6P

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Locked rotor torque	: 170 %	Service factor	: 1.15
Breakdown torque	: 260 %	Temperature rise	: 80 K
Rated speed	: 1170 rpm	Design	: B
Heating constant			
Cooling constant			

Rev.	Changes Summary	Performed	Checked	Date

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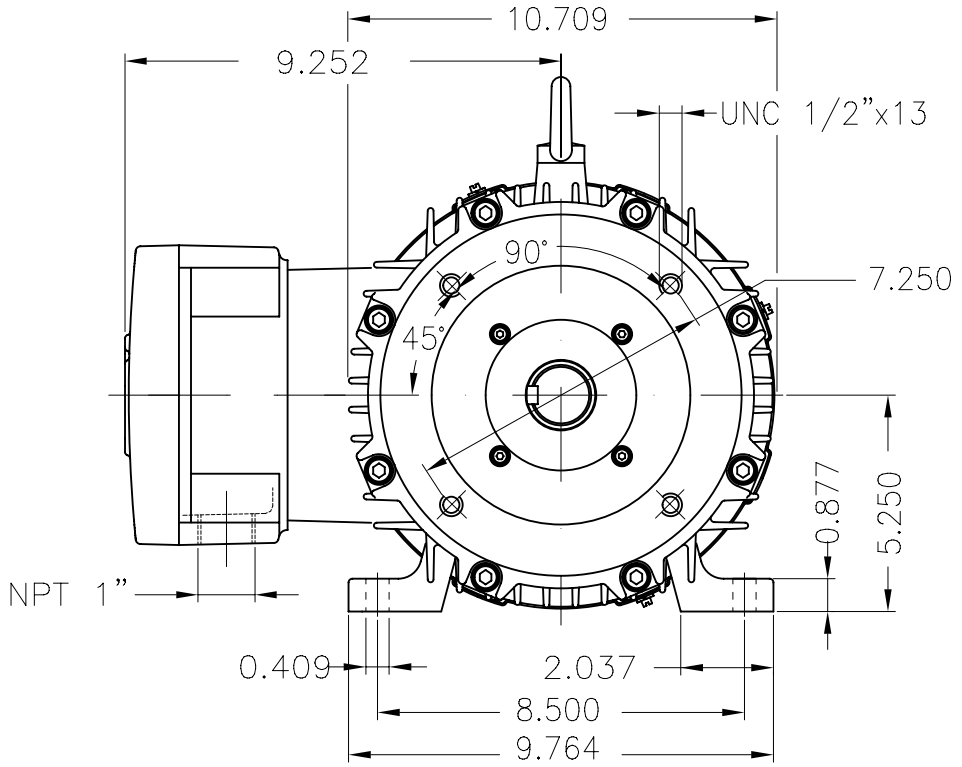
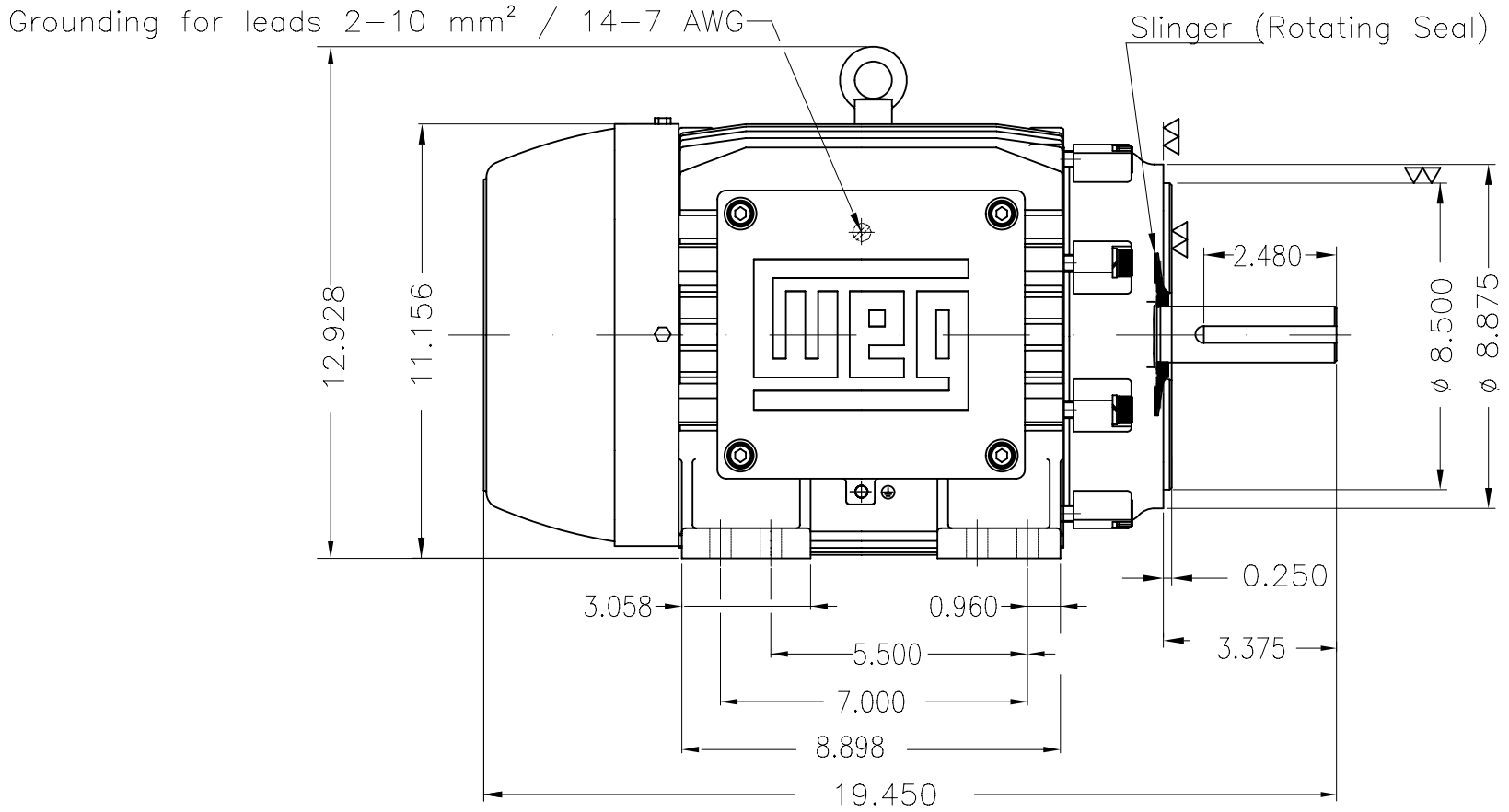
Checked by			Page	Revision
Date	13/04/2021		5 / 6	

EIXO
PADRÃO X
OPCIONAL
ESPECIAL

Dimensões em polegada
Dimensions in inches

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.





Color RAL 5009
Painting plan 202P
Mounting B34R(D)

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER
EXECUTED	USERADMIN	THREE-PHASE EXPLOSION PROOF MOTOR					
CHECKED		FRAME 213/5TC IP55 TEFC					
RELEASED		WEG code: 14296347					
REL DT	13.04.2021	WMO Jaragua do Sul Product Engineering	SHEET 1 / 1				

5 HP 06 Poles 60Hz

A3 ZME

MADE IN BRAZIL

W21X NEMA Premium®

14296347

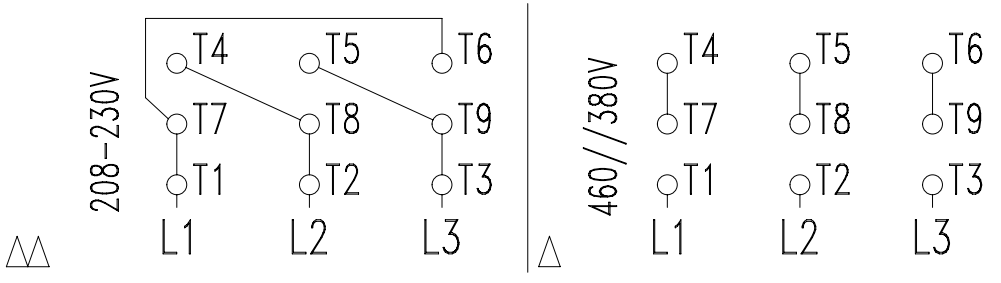
CC029A
Inverter Duty Motor
Severe Duty

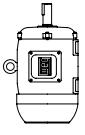
UL LISTED

MODEL 00512XT3E215TC

PH 3	FR 213/5TC	
HP(kW) 5.0(3.7)	HZ 60	IP55
V 230/460	A 13.7/6.83	
RPM 1170	NEMA NOM EFF 89.5%	
PF 0.76	SFA 15.8/7.85	DES B
INS CL F △T 80 K	SF 1.15	ENCL TEFC
DUTY CONT.	CODE J	ALT 1000 m.a.s.l.
AMB 40°C	USABLE @208V 15.1 A	SF 1.15 SFA 17.4
AMB 55°C SF1.0		

5.0HP 3.7kW 50Hz 380V 8.10A 960RPM SF1.00 EFF 86.8% (IE3)





→ 6308-2RS MOBIL POLYREX EM

→ 6207-2RS

223 Lbs

C SA® US
Energy Verified

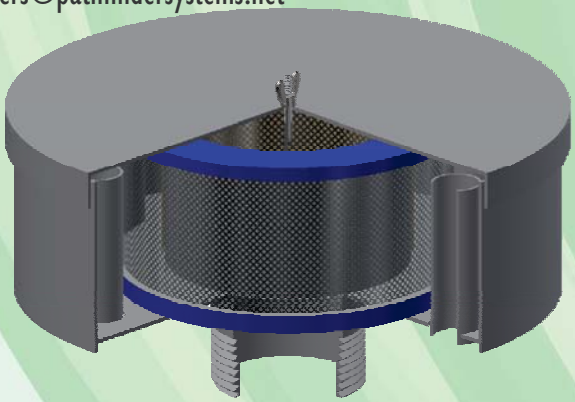
TEMP CODE T3C
CSA/UL: Class I – Div. 1 – Groups C and D
CSA: Class II – Div. 1 – Groups F and G
CSA: Class I – Zone 1 – IIB
EXPLOSION PROOF MOTOR

FOR USE ON VPWM VFD 1000:1VT, 20:1CT, 1.0SF, T3C, AMB 40°C.

PATHFINDER INTAKE AIR FILTERS

Pathfinder Intake Air Filters use multiple sound cancelling and absorption methods to provide a heavy-duty industrial filter for PD blower applications.

816-741-0282
www.pathfindersystems.net
mail@pathfindersystems.net
orders@pathfindersystems.net



Pathfinder Inline Filter Housings (IFS)

Specifications:

- Pleated media for maximum filter media area
- Optimum media area for each size of filter housing
- Pre-filter available as an option. Depending on environment, can increase filtration capacity between 40% to 55%.
- Standard filters are washable
- Temperature range: -20F to 250F.
- Recommended Pressure Differential for changing out filter elements: 10-15 inches H2O
- Durable
- Water Resistant
- **Superior noise attenuation**
- Steel silencing tubes, welded in place for durability.

Standard Polyester Element:

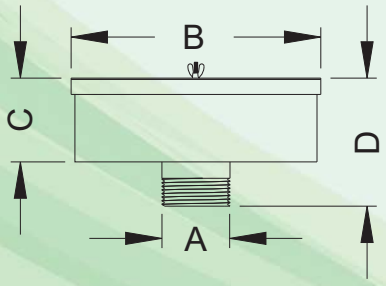
- Reinforced with epoxy coated steel wire mesh
- 5 micron at 99% efficiency
- Higher flow ratings
- Washable for longer life

Optional Paper Element:

- 2 micron at 99% efficiency
- Industrial strength paper element surrounded by galvanized expanded metal
- Single use disposable elements

Pathfinder Inlet Filter Housings (IFS)

Model	A	B	C	D	Rated CFM	Weight	Filter Element
IFS-1	1" NPT	10	4	7	35	9	FL01
IFS-1.5	1.5" NPT	10	4	7	80	9	FL01
IFS-2	2" NPT	10	4	7	135	10	FL01
IFS-2.5	2.5" NPT	10	4	7	180	10	FL01
IFS-3	3" NPT	16	5	8	285	20	FL03
IFS-4	4" NPT	16	5	8	520	20	FL03
IFS-5	5" NPT/FLG	16	5	8	750	23	FL03
IFS-6	6" Flange	20	5	8	1235	40	FL06
IFS-8	8" Flange	20	10	13	2125	50	FL08
IFS-10	10" Flange	26	15.5	20	3335	95	FL10
IFS-12	12" Flange	26	15.5	20	4675	100	FL10
IFS-14	14" Flange	26	15.5	20	5655	115	FL10



Pathfinder Replacement Filter Element	ID	OD	Height
FL01	4 3/4	6 7/8	4 3/16
FL03	7 1/8	10 3/16	5 1/8
FL06	9 1/2	12 9/16	4 7/8
FL08	9 1/2	12 9/16	10
FL10	15	19 3/4	14

C-Vac Canister

816-741-0282
www.pathfindersystems.net
mail@pathfindersystems.net
orders@pathfindersystems.net

This space saving unit contains the vacuum breaker valve, inline filter element, weighted relief valve, and gauge combined into one canister. All units are custom built to accomodate your preferred combination of valves, gauges, swtiches, etc. You won't find anything else like this on the market!

Features

Canister Includes:
- » Vacuum Breaker Valve
- » Weighted Relief Valve
- » Inline Filter Element, Paper
- » Vacuum Gauge

- MPT connection on the weighted relief valve
- Standard connection is compression fitting or flanged
- Multiple sizes available
- Compact space saver

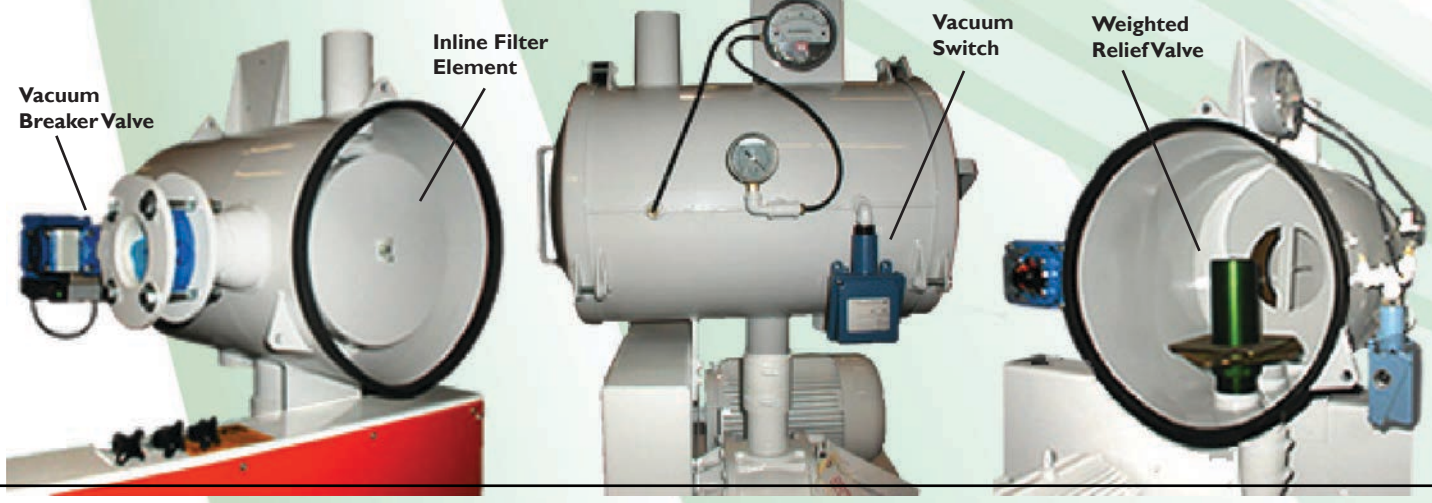
Options Available:
- Differential pressure indicator
- Vacuum Switch
- Filter Element media
  - » Polyester
  - » Polyurethane
  - » Wire mesh

Paper elements are the recommended media for all blower applications since PD blower tolerances can be as small as 0.001 inches. The paper filter media has an efficiency of 99% on 1 micron particles compared to competing polyester elements at 10+ micron particles.

When the vacuum breaker valve opens, filtered air flows through the blower to release the vacuum.

Differential pressure gauge indicates when the filter element requires cleaning or replacement.

Vacuum relief from 2"Hg through 30"Hg: accurate from release back to the set point within 0.8"Hg



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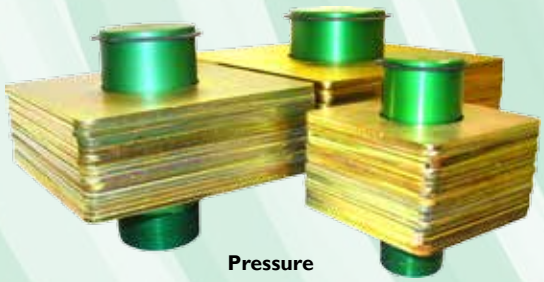
Weighted Relief Valves

We offer our PRESSURE and VACUUM weighted relief valve in 2", 3", and 4" sizes for capacities through 3400 CFM. We couple an elementary design with a high quality anodized and heat-treated aluminum construction to offer reliable performance and simple calibration. Tamper-proof retainer ring provided. Proven design ensures years of reliable service.



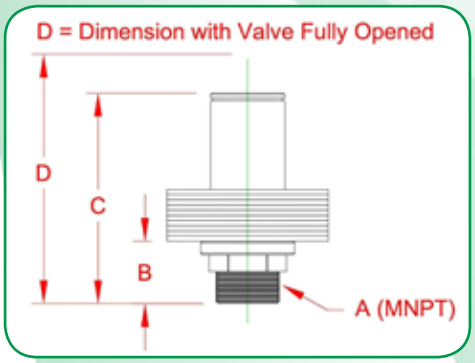
Pressure

Retainer Ring

Features

Manufactured locally in KC MO

- Anodized Aluminum construction for years of trouble-free service;
- 2", 3", and 4" models;
- Pressure models have standard MPT connections. Available from 1 PSIG thru 29 PSIG with a calibrated 0.5 PSIG increment per removable disc;
- Vacuum canisters have standard FPT connnections. Available from 2"Hg thru 30"Hg with a calibrated 1"Hg increment per removable disc;
- Minimal maintenance required;
- Simple method of opening and closing insures that the valve is virtually chatter-free;
- Simple operation. Line pressure naturally displaces the weighted cap upwards and off the valve seat. As the pressure increases, the valve exposes more vent area for higher flow;
- High flow-through capacity;
- Valve automatically seats itself when the pressure is removed;
- All operating surfaces are machined. The entire valve is heat treated and anodized for the highest quality;
- Retainer ring ensures valve settings are tamper resistance;
- STOCK item for quick shipping.



Valve Size (A)	2"	3"	4"
Dim B	2.31"	3.18"	3.31"
Dim C	7.81"	8.68"	8.75"
Dim D	9.25"	10"	11"

Weights	2"	3"	4"
0.5 PSIG	6" SQ	9.31" SQ	12" SQ
0.5 PSIG Diagonal	8.87"	12.62"	16.37"
1.0 PSIG	8.12" SQ	12.75" SQ	16.37" SQ
1.0 PSIG Diagonal	10.81"	17.43"	22.56"

Custom Spool Pieces Available

Vaccum Canister

Standard White
Custom colors available

Vacuum Canister	2"	3"	4"
Overall Diameter including Tabs	12.43	16.56	20.93
Dished Head Diameter	10"	14"	18"
Overall Unit Height - Top of Handle to Bottom of NPT Port	13.75"	16.25"	17.75"
Canister Height	11.68	13.75"	15.12"
NPT Ports	2"	3"	4"

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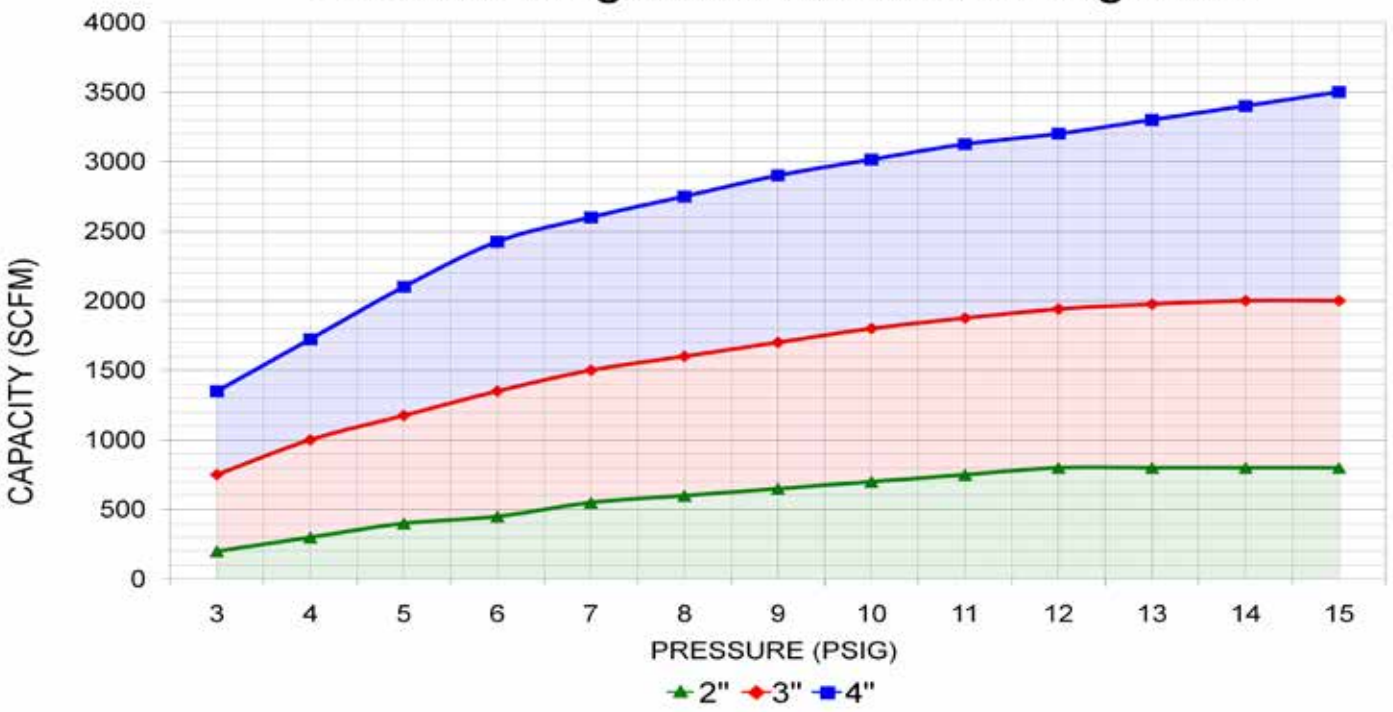
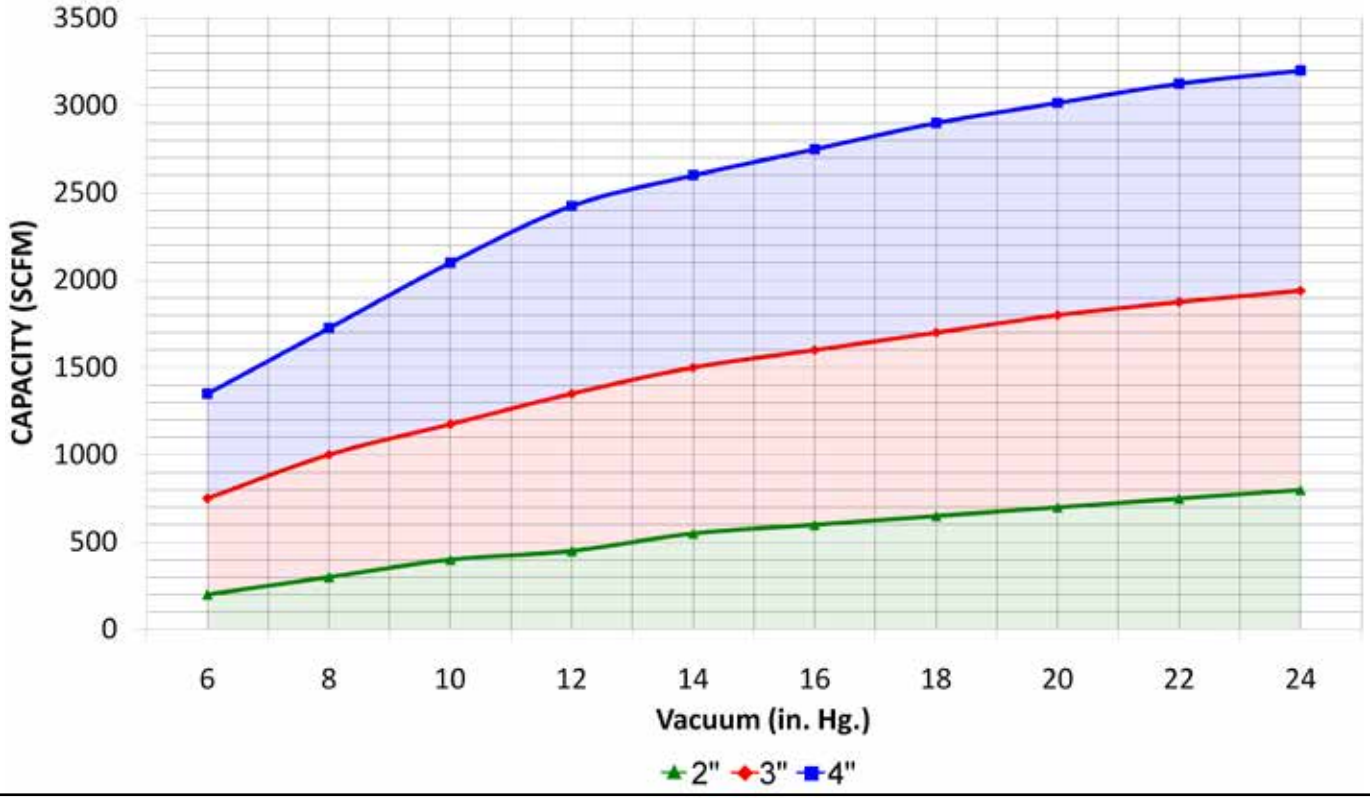
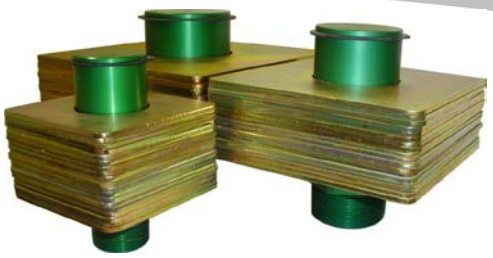
Pressure Weighted Relief Valve Sizing Chart



Vacuum Weighted Relief Valve Sizing Chart





Weighted Relief Valve Installation and Operation

Pathfinder Systems would like to thank you for your purchase of a weighted relief valve. You should find that it provides years of trouble-free operation.

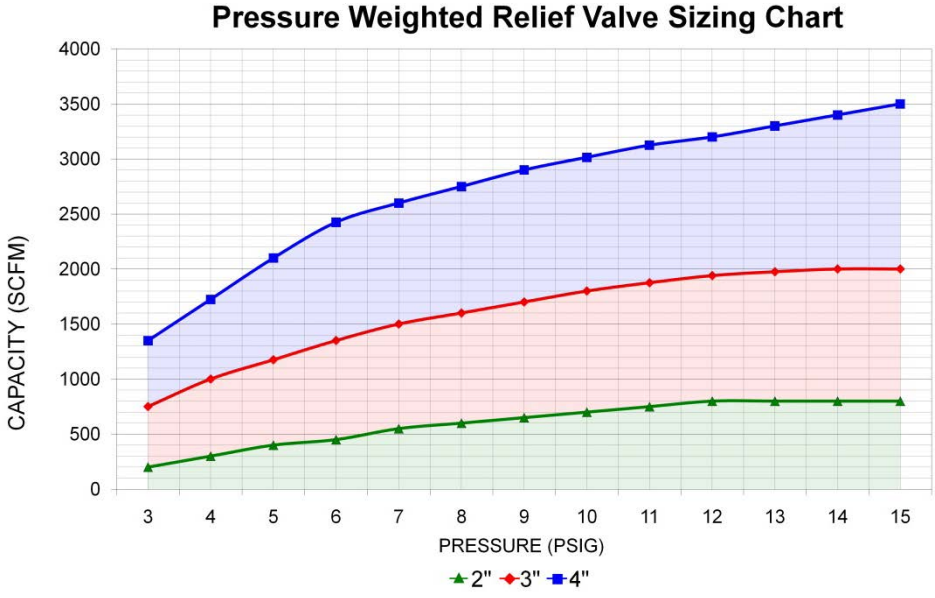
Warning

The weights may have sharp edges. It is recommended that you wear gloves when you are handling the weights. Protect your eyes. Do not look into the discharging valve.

1. Use Teflon tape on all threads. Hand tighten. Do not over tighten!
2. Mount vertical and plumb. Check regularly for proper operation and cleanliness.
3. We recommend lubricating mating surfaces with 30-weight oil. There should be a light film of oil on the plunger at all times.

   Each valve body is 1 PSI. The valve has available either 0.5 PSI incremental weights or 1.0 PSI increment weights. Each valve size can utilize a maximum of (28) 0.5 PSI or (28) 1.0 PSI weights.

   For example, a 2" valve set at 15 PSI would require (28) 0.5 PSI weights. Divide 15 PSI by 0.5 PSI = 30 and subtract (2) 0.5 for the body (1 PSIG) for a total of (28) 0.5 weights. Another example, a 3" valve set at 17.5 PSI requires (16) 1.0 PSI weights and (1) 0.5 PSI with 1.0 PSI for the body.
4. To adjust the weights, use a snap ring pliers to remove the snap ring and then add or remove weights. The snap ring is not necessary for operation. It is provided so that once weights are set, the valve cannot be easily modified in the field. If necessary, you may install a wire with a lead seal to prevent the valve from being modified.



Canister Weighted Relief Valve Installation and Operation

Pathfinder Systems would like to thank you for your purchase of a weighted relief valve with canister. You should find that it provides years of trouble-free operation.

Warning
The weights may have sharp edges. It is recommended that you wear gloves when you are handling the weights.
Protect your eyes. Do not look into the discharging valve.

Please follow the instructions below:

1. If necessary, remove the cover.
2. Wrap Teflon tape on the plunger threads.
3. Install the plunger in the canister. Hand- tighten to prevent damage to the aluminum threads. Do not use a pipe wrench to tighten. **Do not over tighten!**

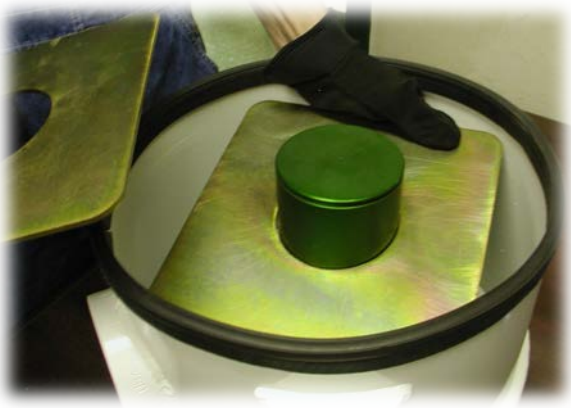
   Mount vertical and plumb. Check regularly for proper operation and cleanliness.

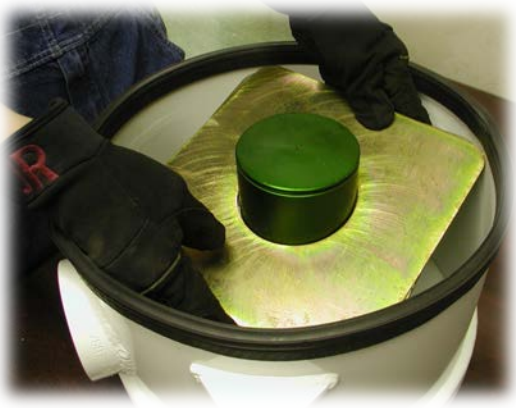
4. Place the bonnet, as shown, on the plunger. We recommend lubricating mating surfaces with 30-weight oil. There should be a light film of oil on the plunger at all times.

5. Place all of the provided weights on the bonnet as shown below.

   Pressure – Each plunger/bonnet assembly is 1 PSI. The valve uses 0.5 PSI incremental weights. Each valve size can utilize a maximum of (28) 0.5 PSI weights. For example, a 2” valve set at 15 PSI would require (28) 0.5 PSI weights. Divide 15 PSI by 0.5 PSI = 30 and subtract (2) 0.5 for the body (1 PSIG) for a total of (28) 0.5 weights.

   Vacuum – Each plunger/bonnet assembly is equal to 2 inHg. Each 0.5 weight is equal to 1 inHg. Each valve size can utilize a maximum of (28) 1 inHg weights. For example, 2" a valve set at 6 inHg would ship with the plunger/bonnet for 2 inHg and (4) 1 inHg weights. 2 + 4 = 6.





6. Install the provided snap ring into the groove at the top of the bonnet. If you don't have a tool as shown in the picture, you can use a needle nose pliers or similar.

   To adjust the weights, use a snap ring pliers to remove the snap ring and then add or remove weights. The snap ring is not necessary for operation. It is provided so that once weights are set, the valve cannot be easily modified in the field. If necessary, you may install a wire with a lead seal to prevent the valve from being modified.

7. Line up the tabs with the lid. Secure the handles.

8. Connect the canister to your equipment.

Check Valves

816-741-0282
www.pathfindersystems.net
mail@pathfindersystems.net
orders@pathfindersystems.net

We offer our wafer check valves in 3" through 10". These lightweight aluminum valves are designed for installation between two flanges in vertical or horizontal piping systems. For use in the pneumatic and bulk material handling industries to stop flow reversal in air and gas applications. Features a balanced disc where only 33% of the disc area is unbalanced. This is considerably less than conventional check valves. This feature tends to reduce back-flow and eliminate slamming (a major factor in valve failure), and permits the disc to open with a minimum of pressure differential.

Flange Stub Adapters and Custom Spool Pieces Available

Features

Manufactured locally in KC MO

Minimum Pressure Drop
- » Maximum flow due to the low profile, aerodynamic disc design;

Fast Delivery
- » Immediate shipment from our large in-house STOCK;

Simple Design
- » Only one moving part ensures long, trouble-free service;

One Piece thru Stem
- » Stainless steel for strength and durability;

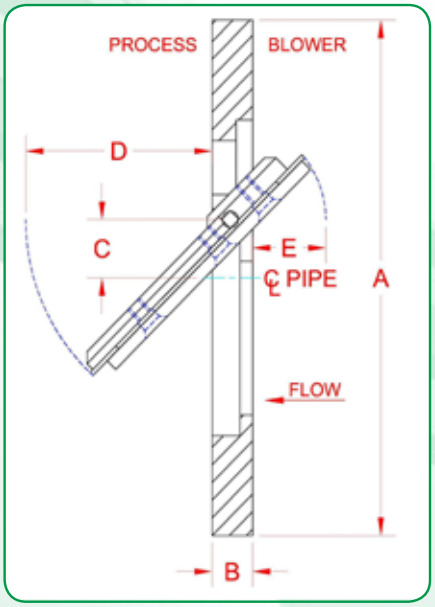
Low Maintenance Cost
- » Seat is easily replaced;

Stem Bushings
- » Teflon for an extended service life; rated to +500°F;

Aluminum Body and Disc
- » Lighweight for easy installation. High strength aluminum alloy for strength and extended service life;

Teflon Seal
- » Seal and stem bushings are standard with Teflon for a long service life;

Wafer Design
- » Fits between 150# flanges. Minimal space required for lightweight piping applications.



Approximate Dimensions in Inches

Valve Size	A	B	C	D	E
CV-3"	5-3/8	5/8	9/16	1-5/8	3/8
CV-4"	6-7/8	5/8	3/4	2-1/4	5/8
CV-5"	7-3/4	5/8	7/8	2-7/8	1-1/8
CV-6"	8-3/4	5/8	1-1/8	3-5/8	1-5/16
CV-8"	11	3/4	1-3/8	4-1/2	2
CV-10"	13-3/8	3/4	1-1/2	5-3/4	2-7/8

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