End Suction Centrifugal

TH Series

Operating Instructions, Installation & Maintenance Manual

EBARA Pumps Americas Corporation

Operating, Installation, and Maintenance

Contents

Introduction

This Operation, Installation, and Maintenance manual is designed to help you get the best performance and longest life from your EBARA pump.

This pump is a TH Series, end suction centrifugal pump. It is capable of being used in a variety of applications including heating, air conditions, pressure boosting, cooling water transfer and non-potable water supply.

If you have any questions regarding the pump or its applications which are not covered in this manual or in other literature accompanying this unit, please contact your local EBARA distributor or visit **www.pumpsebara.com**.

Safety Information

⚠ WARNING

IMPORTANT SAFETY INSTRUCTIONS

Rules for Safe Installation and Operation

1. Read these rules and instructions carefully. Failure to follow them could cause serious bodily injury and/or property damage.
2. Check your local codes before installing. You must comply with their rules and regulations
3. For maximum safety, this product should be connected to a grounded circuit equipped with a ground fault interrupter device.
4. Before installing this product, have the electrical circuit checked by an electrician to make sure it is properly grounded.
5. Before installing or servicing your pump, BE CERTAIN pump power source is disconnected.
6. Make sure the line voltage and frequency of the electrical current supply agrees with the motor wiring. If motor is dual voltage type, BE SURE it is wired correctly for your power supply.
7. Complete pump and piping system MUST be protected against below freezing temperature. Failure to do so could cause severe damage and voids the Warranty.
8. Avoid system pressures that may exceed one and a half times the operating point selected from the pump performance curve.
9. Do not run your pump dry. If it is, there will be damage to the pump seal.

Safety Information (Continued)

PACKAGE CONTENTS
1. Be sure all parts have been furnished and that nothing has been damaged in shipment.
2. The catalog lists all parts included with package. A packing list packed with pump, also lists contents.
3. OPEN PACKAGES AND MAKE THIS CHECK BEFORE GOING ON JOB.

HANDLING - Move with care and safety to avoid accidents or equipment damage. Heavy components should be lifted using lugs provided, as shown in Figure 1. Pump-motor assembly must be lifted as shown in Figure 2.

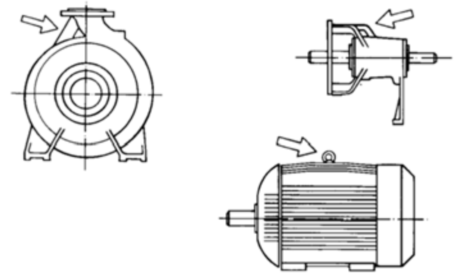


Figure 1 - Transportation of components using lug

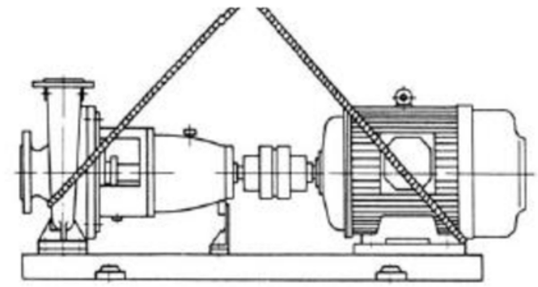


Figure 2 – Transportation of pump-motor assembly

STORAGE - A rust inhibitor treatment that lasts for one year is to be applied to the inner parts of the pump and areas that are not painted. If pump is stored over one year, a new treatment is needed. To apply treatment, disassemble pump and clean the internal parts with organic solvents (kerosene or benzene) to completely remove the old protective film.
Apply a new layer of inhibitor and let pump dry before reassembly. Suction and discharge nozzles must always be covered to prevent the entry of foreign objects inside the pump.

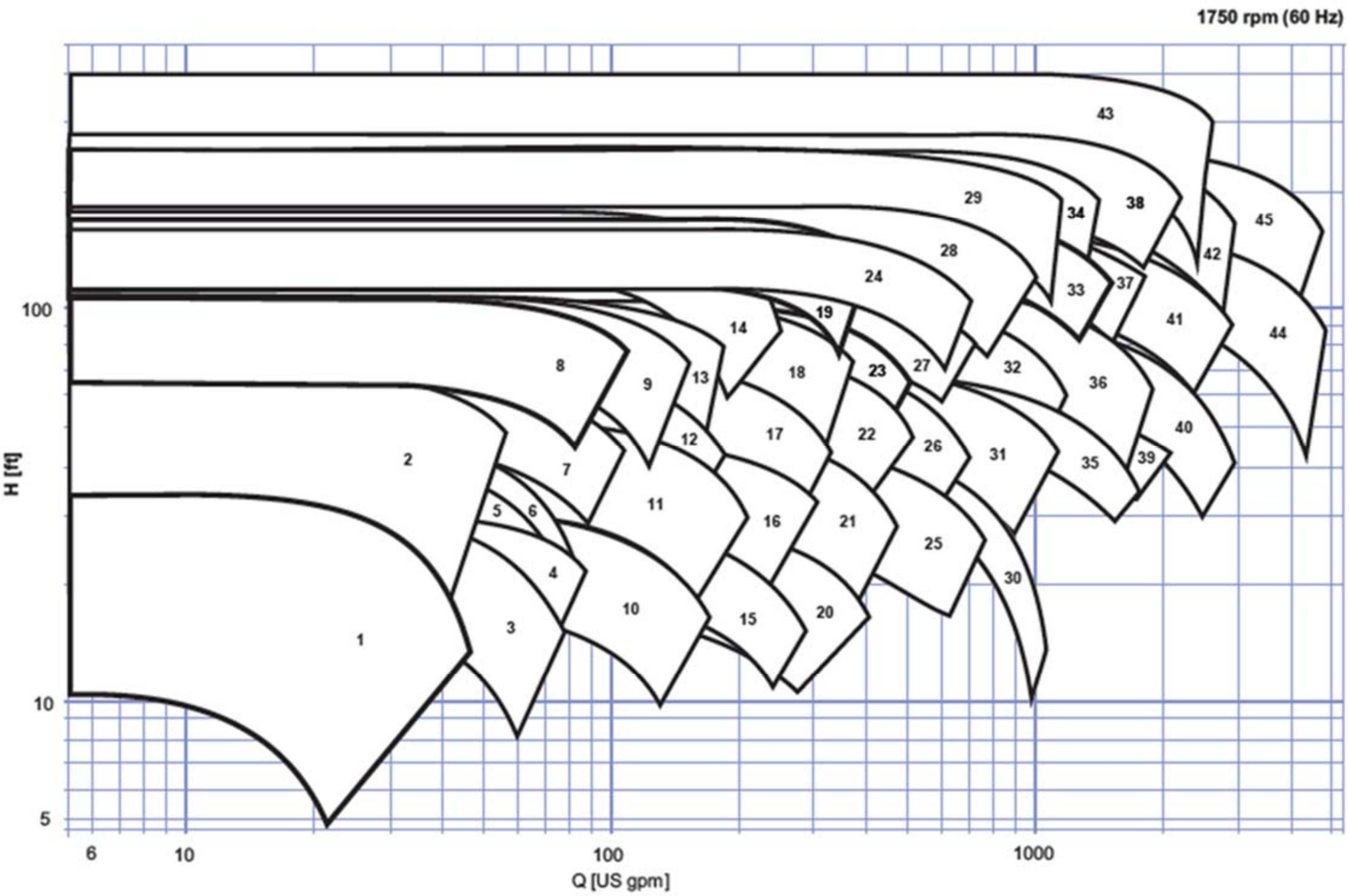
FREEZING – Care should be taken to prevent the pump from freezing during cold weather. It may be necessary to drain the pump casing when not in operation. Drain by removing the pipe plug in the bottom of the casing.

ROTATION – All motors should be checked to ensure proper rotation. Fill with water prior to conducting rotational checks.

STARTING – When the pump is up to operating speed, open the discharge valve to obtain desired capacity or pressure. **WARNING! DO NOT ALLOW THE PUMP TO RUN WITH THE DISCHARGE VALVE TIGHTLY CLOSED. IF THE PUMP RUNS FOR AN EXTENDED PERIOD OF TIME WITHOUT LIQUID BEING DISCHARGED, THE LIQUID IN THE PUMP CASING CAN GET EXTREMELY HOT CAUSING SEVERE DAMAGE TO THE PUMP AND POSSIBLY CAUSE PERSONAL INJURY.**

Model TH Selection Chart

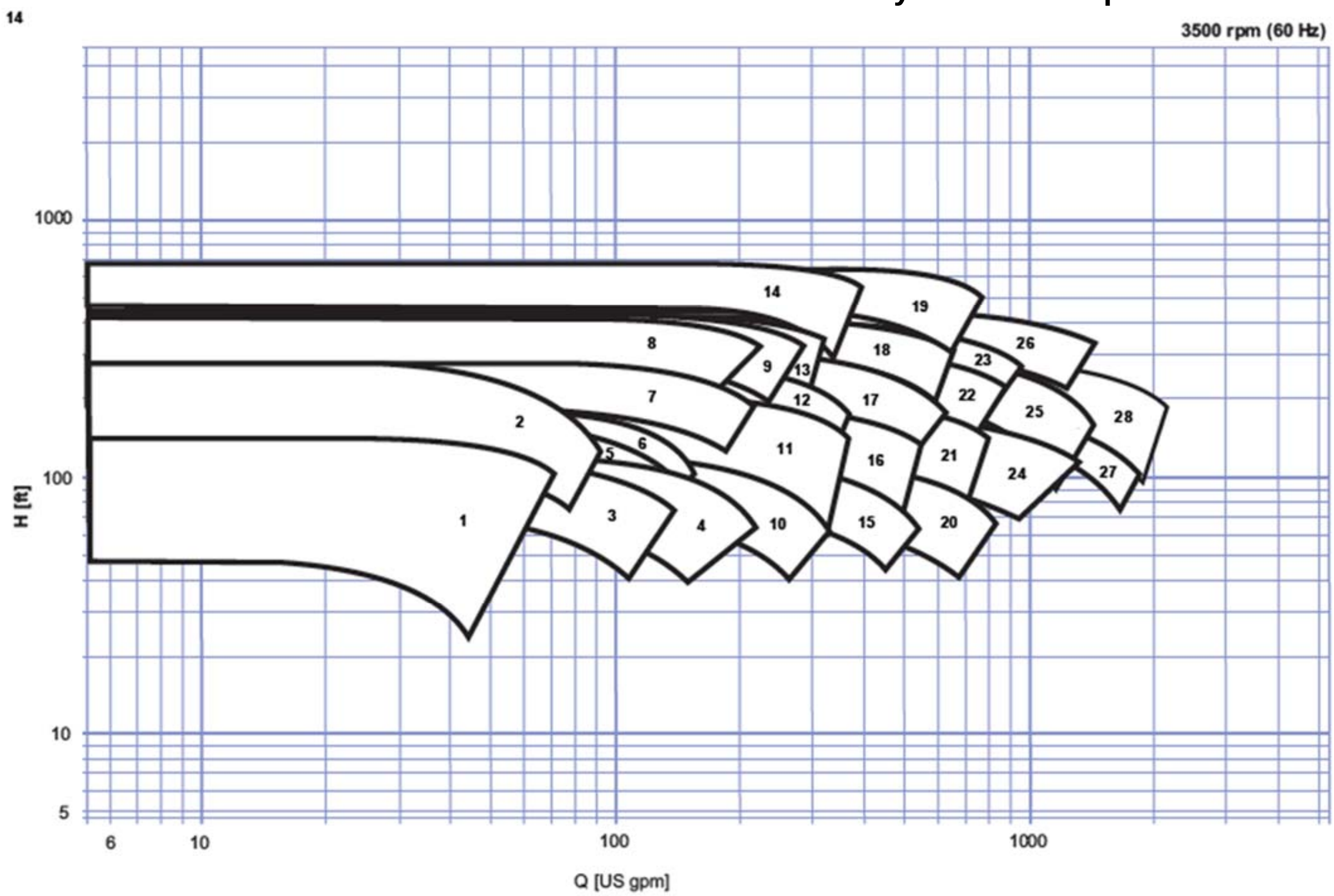
Synchronous Speed 1750 RPM



1. 25-150
2. 25-200
3. 32-125.1
4. 32-125
5. 32-160.1
6. 32-160
7. 32-200
8. 32-350.1
9. 32-250
10. 40-125
11. 40-160
12. 40-200
13. 40-250
14. 40-315
15. 50-125
16. 50-160
17. 50-200
18. 50-250
19. 50-315
20. 65-125
21. 65-160
22. 65-200
23. 65-250
24. 65-315
25. 80-160
26. 80-200
27. 80-250
28. 80-315
29. 80-400
30. 100-160
31. 100-200
32. 100-250
33. 100-315
34. 100-400
35. 125-200
36. 125-250
37. 125-315
38. 125-400
39. 150-200
40. 150-250
41. 150-315
42. 150-400
43. 150-500
44. 200-315
45. 200-400

Model TH Selection Chart

Synchronous Speed 3500 RPM



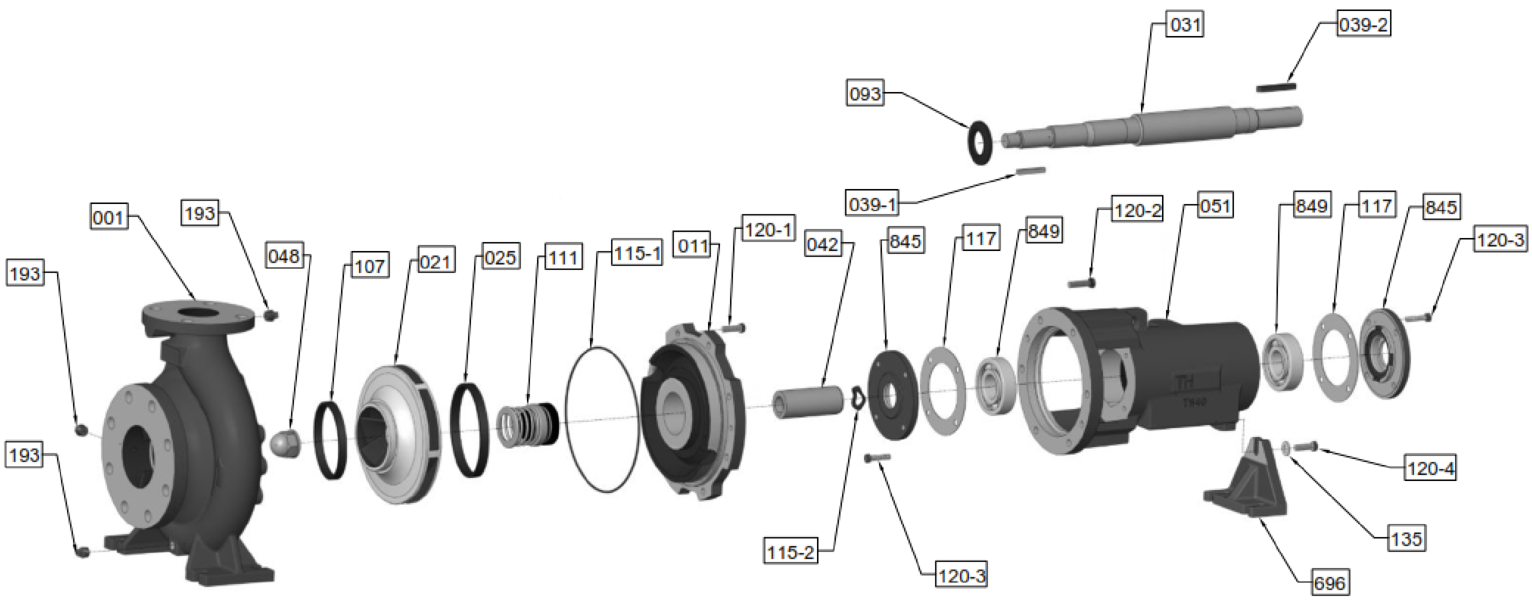
1. 25-150
2. 25-200
3. 32-125.1
4. 32-125
5. 32-160.1
6. 32-160
7. 32-200
8. 32-350.1
9. 32-250
10. 40-125
11. 40-160
12. 40-200
13. 40-250
14. 40-315
15. 50-125
16. 50-160
17. 50-200
18. 50-250
19. 50-315
20. 65-125
21. 65-160
22. 65-200
23. 65-250
24. 80-160
25. 80-200
26. 80-250
27. 100-160
28. 100-200

Model THD Specifications

	Standard	Optional
Size		
Suction x Discharge ANSI Compatible Flange	TH-25-150 – 1¼” x 1” TH-25-200 – 1½” x 1” TH-32 – 2” x 1¼” TH-40 – 2½” x 1½” TH-50 – 3” x 2” TH-65 – 4” x 2½” TH-80 – 5” x 3” TH-100 – 5” x 4” TH-125 – 6” x 5” TH-150 – 8” x 6”	Consult factory for threaded connections
Range of HP		
Closed Coupled Frame Mounted	1 HP to 60 HP 1 HP to 300 HP	
Range of Performance		
Capacity Head	8 to 3,000 5 to 710 ft.	
Liquid Handled		
Type of Liquid Temperature Max. Working Pressure	Clean Water 221°F (105°C) 232 PSI (16 Bar)	
Materials		
Casing Impeller Shaft Sleeve Bracket	Cast Iron Cast Iron 304SS Cast Iron	*Consult factory for optional materials*
Shaft Seal	Mechanical Seal – Type 21	
Seal Material	Carbon/Ceramic/Buna	Carbon/Ceramic/Viton Carbon/Ceramic/EPDM Silicon/Silicon/Viton
Direction of Rotation	Clockwise when viewed from motor	
Motor		
Type Speed Bearing Single Phase Three Phase	NEMA JP Frame 60 Hz, 1750 and 3500 RPM 2 Pole and 4 Pole Ball Bearing TEFC – *Consult Factory* ODP - *Consult Factory* TEFC - 1 HP to 60 HP ODP - *Consult Factory*	

Model TH Sectional View

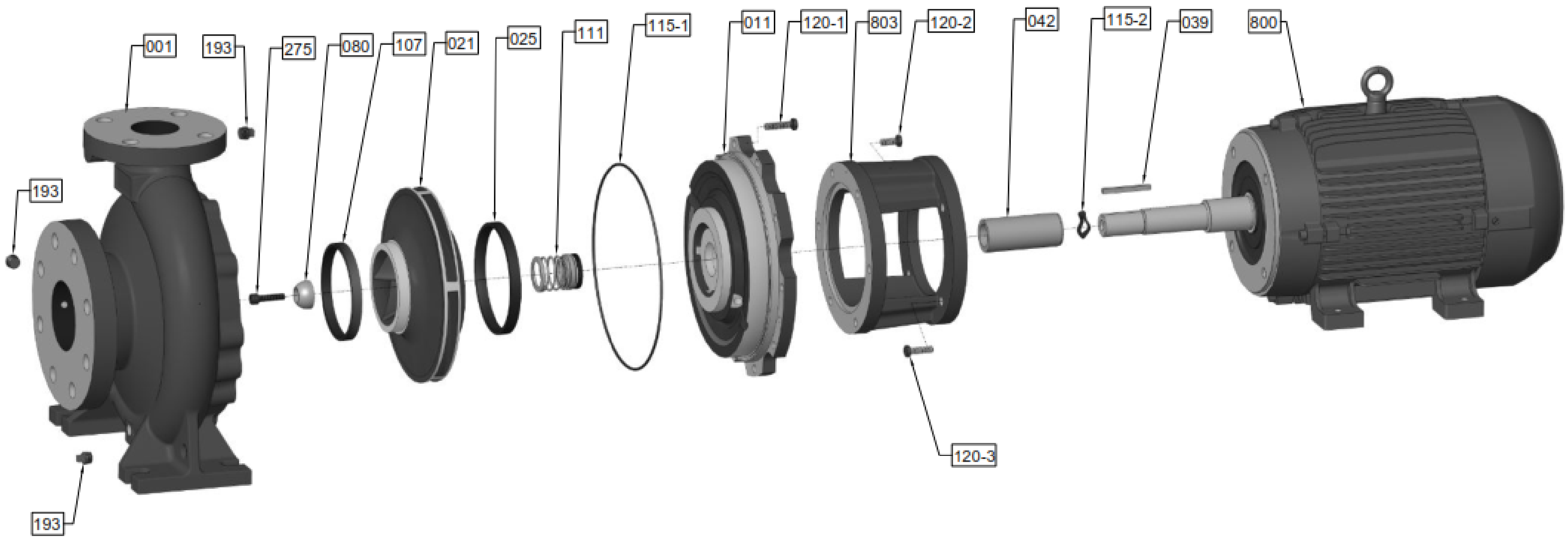
Frame Mounted



Item Number	Part Name	Material	No.
001	Casing	Cast Iron	1
011	Casing Cover	Cast Iron	1
021	Impeller	Cast Iron	1
025	Impeller Wear Ring	410 SS	1
031	Shaft	SAE 1045 Steel	1
039-1	Key	Steel	1
039-2	Key	Steel	1
042	Shaft Sleeve	304 SS	1
048	Impeller Nut	316 SS	1
051	Bearing Housing	Cast Iron	1
093	Thrower	Nitrile Rubber	1
107	Casing Wear Ring	410 SS	1
111	Mechanical Seal	Ceramic/Graphite/Buna	1
115-1	O-ring	Buna	1
115-2	O-ring	Buna	1
117	Gasket		2
120-1	Bolt	Steel	8
120-2	Bolt	Steel	6
120-3	Bolt	Steel	8
120-4	Bolt	Steel	1
135	Washer	Steel	1
193	Plug	Steel	3
696	Motor Support	Cast Iron	1
845	Bearing Cover	Cast Iron	2
849	Ball Bearing		2

Model THD Sectional View

Closed-Coupled



Item Number	Part Name	Material	No.
001	Casing	Cast Iron	1
011	Casing Cover	Cast Iron	1
021	Impeller	Cast Iron	1
025	Impeller Wear Ring	410 SS	1
039	Key	Steel	1
042	Shaft Sleeve	304 SS	1
080	Bushing	Steel	1
107	Casing Wear Ring	410 SS	1
111	Mechanical Seal	Ceramic/Graphite/Buna	1
115-1	O-ring	Buna	1
115-2	O-ring	Buna	1
120-1	Bolt	Steel	4
120-2	Bolt	Steel	1
120-3	Bolt	Steel	1
193	Plug	Steel	3
275	Impeller Bolt	Steel	1
800	Motor		1
803	Motor Bracket	Cast Iron	1

Rules for Safe Installation

LOCATION OF UNIT – The pump should be installed as near to the liquid source as is practical so that the static suction head (vertical distance from the center line of the pump to water level) is maximized, and so that a short, direct suction pipe may be used. The capacity of a centrifugal pump is reduced when the unit is operated under a high suction lift. The piping should be as free from turns and bends as possible, as elbows and fittings greatly increase friction loss. Place the unit so that it is readily accessible for service and maintenance and on a solid foundation, which provides a rigid and vibration-free support. Protect the pump against flooding and excess moisture.

FOUNDATION – Use a level concrete base to provide a rigid base that will minimize deflections and vibration. Leveling should be done using metallic shims along with anchor bolts. When mounting pump to foundation, disconnect suction and discharge pipes. Piping cannot be aligned until shaft alignment procedure is finished. Use a precision level to adjust jackscrews to make sure the suction and discharge flanges are level before connecting piping.

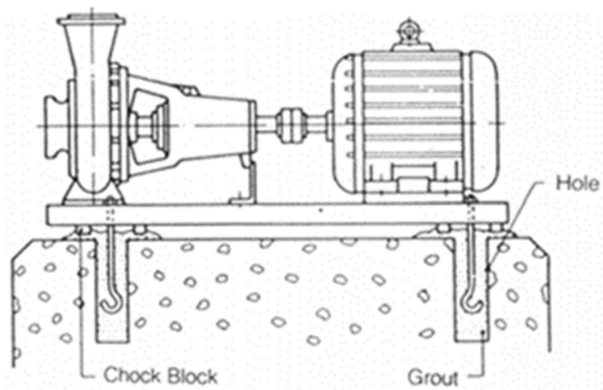


Figure 3 – Foundation installation

ALINGMENT PROCEDURES

WARNING

Alignment

The alignment of the pump and motor is critical for trouble-free mechanical operation. Follow shaft alignment procedures to prevent catastrophic failure of motor components or unintended contact of rotating parts. It is imperative the alignment is checked after the pump is leveled on the foundation, after the assembly has been grouted and after the piping has been connected. Misalignment can cause noise during operation, assembly vibrations, premature bearing failure, and unit displacement on the foundation. **Failure to check alignment can cause personal injury or damage to the motor/pump assembly.** Always disconnect and lock out power to the motor before you perform any installation or maintenance tasks.

Rules for Safe Installation (Continued)

ALINGMENT PROCEDURES(continued)

1. Check axial clearance of coupling at every 90° increment. (see figure 4) Axial clearances should be examined using a feeler gauge.
2. Use a straight edge to check radial alignment at every 90° increment. Place the straight edge across the two rims of the sleeve coupling to check there is no light path between the edge and the coupling. The maximum admissible radial clearance is .008 in (0.2 mm.)

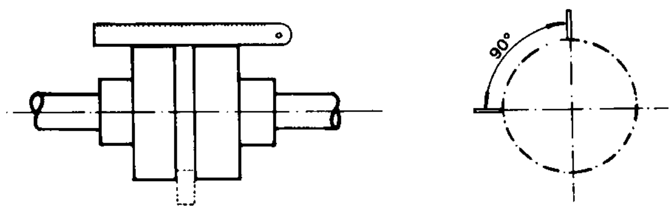


Figure 4 – Alignment with feeler gauge and straight edge

3. Align the assembly by loosening the motor bolts and move the motor laterally or insert shims as needed.
4. Tighten the motor bolts then recheck the alignment.

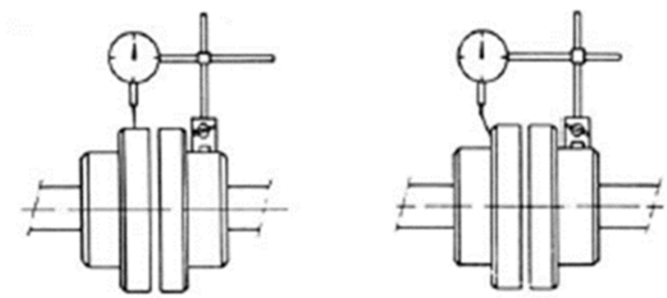


Figure 5 – Coupling alignment using dial indicator

Coupling Alignment can be performed using a dial indicator. See figure 7.

1. Make a reference line on coupling sleeves.
2. Move the dial to zero.
3. Turn the coupling half that has the dial fixed on it.
4. Make dial reading to determinate if the assembly requires an adjustment in the alignment.

GROUTING –After the alignment has been made and checked, tighten the anchor bolts, but not fully. After this is completed the assembly base may be grouted. The anchor bolts may be tightened fully after the grout has been able to dry for 48 hours. Grouting is necessary for a vibration free operation, except in cases of portable units for specific applications. Unless otherwise noted in design specifications, the metal base must be filled with grout. When grouting, please use the following steps,

- Pour the grout into the cavities of the baseplate, vibrate as needed to avoid the formation of air pockets or gaps.
- After piping has been connected and anchor bolts have been tightened, check the alignment of the assembly again.
- After grouting has become completely dry, paint its edges to protect against moisture.
- Be sure to use non-shrink grout.

Rules for Safe Installation (Continued)

PIPING - Pipes must line up and not be forced into position. Piping should be independently supported near the pump so that no strain will be placed on the pump casing. Where any noise is objectionable, pump should be insulated from the piping with vibration isolation devices. Always keep pipe size as large as possible and use a minimum of fittings to reduce friction losses.

SUCTION PIPING – Suction pipe should be direct and as short as possible. It should be at least one size larger than suction flange size and should have a minimum of elbows and fittings (5 to 6 pipe diameters of straight pipe before inlet is recommended). The piping should be laid out so that it slopes upward to pump without dips or high points so that air pockets are eliminated. The highest point in the suction piping should be the pump inlet except where liquid flows to the pump inlet under pressure. The suction pipe must be tight and free of air leaks or pump will not operate properly. To avoid vortex, make sure the end of the suction pipe is submerged twice as much as the size of the pipe diameter.

DISCHARGE PIPING – Discharge piping should never be smaller than pump flange size and should preferably be one size larger. A gate valve should always be installed in discharge line for throttling if capacity is incorrect. To protect the pump from water hammer and to prevent backflow, a check valve should be installed in the discharge line between the pump and gate valve. On points where it is necessary to bleed air, vent valves should be installed.

⚠ WARNING

Pre-operation Cautions

Make certain the motor is not connected to a power source until the motor is properly assembled and mounted. Serious personal injury or damage to the motor/pump assembly could occur if the motor is activated improperly. **Only certified electricians should make electrical connections**.

1. Prime the pump by adding fluid to the volute case through the top plug. To properly prime the pump, venting may be required.
2. Check the nameplate on the motor to determine the correct wiring procedure for your intended power source and if the motor is single or three phase. Connect the motor to a power source by following the wiring procedure on the motor's nameplate.

ELECTRICAL CONNECTIONS – Be sure motor wiring is connected for voltage being used. Follow the correct wiring procedure on the motor for the voltage you are using. Unit should be connected to a separate circuit. A fused disconnect switch or circuit breaker must be used in this circuit. Wire of sufficient size should be used to keep voltage drop to a maximum of 5%. Single phase motors have built-in overload protection. Three phase motors require a control box. Install overload protection to help prevent motor damage. Flexible metallic conduit should be used to protect the motor leads. Disconnect the coupling sleeves and momentarily turn on the motor to check if the rotation direction is the same as indicated at the pump. If the rotation is incorrect, change two power leads**.**

Start and Operation

STARTING – Please follow below procedure to start pump,

1. Check if the pump-motor assembly is aligned and securely fastened to the baseplate.
2. Check the piping is free of leakage, especially the suction piping.
3. Connect and run auxiliary pipelines and connections, if any.
4. Place the coupling guard and secure it to the baseplate.
5. Prime the pump. Remove the plug from the top of the casing. Fill with water or pumped liquid through the hole. Place the plug back in place.
   Note: Priming can also be performed using a vacuum system or directly when it is a positive suction installation.
6. Check the rotation direction of the driver with a quick start. If the rotation direction is wrong, invert the electric motor connection.
7. Close discharge valve and open suction valve, if any.
8. Start the driver.
9. Slowly open discharge valve. Check motor current. Motor power should not exceed nominal value.
   Note: It is recommended, especially for single-phase small drivers, to check if the rotating assembly is turning freely before starting the motor, to prevent unnecessary loads and premature failure.

OPERATION – When the pump is up to operating speed, open the discharge valve to obtain desired capacity or pressure. **WARNING! DO NOT OPERATE FOR PROLONGED PERIODS OF TIME WITHOUT FLOW THROUGH THE PUMP. THIS CAN RESULT IN DAMAGE TO THE MOTOR AND PUMP.** If there is a power failure, turn the power switch off. Otherwise the pump may start-up suddenly when the power supply is resumed, exposing personnel to possible danger. When the pump is not in use for prolonged periods, such as wintertime, drain all fluid from the pump to prevent freezing damage.

Maintenance

SERVICE - Keep ventilation openings clear of extraneous objects which may hinder free flow of air through motor. Motor bearings are lubricated during manufacture. Additional lubrication is not required during their normal lifetime.

⚠ WARNING

Draining

The pump and piping should always be protected against freezing temperatures. If there is any danger of freezing, the unit should be drained. To drain the pump, remove the drain plug at the bottom of the volute, and remove the priming plug to vent the pump. Drain all piping.

Maintenance

⚠ **WARNING**

Power Supply

Turn off power to motor and disconnect power cable before servicing unit. All maintenance should be done by qualified personnel.

DISASSEMBLY – All pump parts can be removed from casing without disturbing the piping. Remove casing bolts, and motor mounting bolts, to slide the reminder of the pump and motor away from the casing.

VOLUTE CASE

a) Drain pump case by removing drain plugs.
b) Remove the bolts securing volute case to pump bracket.
c) Pry volute case from casing cover.

IMPELLER

Hold the motor shaft and turn the impeller counterclockwise (as viewed from pump end).

SEAL

a) Remove the rotating part of the seal by pulling it off the shaft.
b) The stationary seat can be pressed from the casing cover.

CHECK LIST FOR EXAMINATION OF PUMP PARTS

IMPELLER - Replace the impeller if any vane is broken, excessive erosion shows, or if wear ring surfaces are worn. Impeller cap screw, washer and lock washer should be replaced if damaged.

MECHANICAL SEAL - Seal face, O-ring and sealing members should be free of burrs and dirt. Complete seal assembly should be replaced if not in perfect condition.

SHAFT- Shaft sleeve surface under seal must be clean, smooth and without any grooves. It should be replaced if necessary.

VOLUTE AND SEAL PLATE WEAR RING SURFACES - If worn, replace the necessary part. If furnished with pressed in wear rings, only the rings need be replaced.

GASKETS - Volute, suction pipe and discharge pipe gaskets should be checked for damage. Replace if necessary.

NOTE

If replacement parts are ordered, please furnish the following information to your EBARA distributor:

1. EBARA Model number and Serial number on the nameplate.
2. Item numbers
3. Description of pump part

THD Assembly Instruction

Pump Assembly – THD Closed Coupled

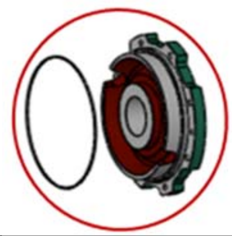
⚠ WARNING

Power

Make certain the motor is not connected to a power source. Do not install or assemble the pump on a motor connected to a power source. Severe injury could occur if the motor

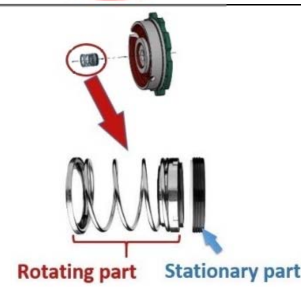
Step 1

Fix O-ring (item 115) at case cover (item 011). Use grease to hold the O-ring in place. Do not use any kind of adhesive, this should cause chemical damage at rubber/elastomer.



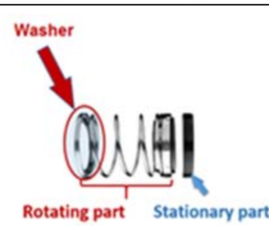
Step 2

Insert the stationary part of mechanical seal (item 696) into case cover (item 011) using grease or another type of lubricant. Use a soft face tool to avoid damages. After the stationary part is in place, clean the face with an alcohol wipe.



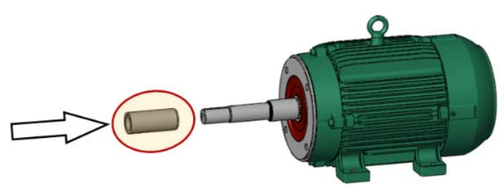
Step 3

Place the rotating part of the mechanical seal on the shaft sleeve (item 042), centring the washer to the impeller side.



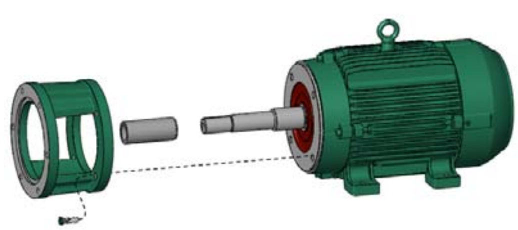
Step 4

Insert the O-ring (item 115-2) and shaft sleeve (item 042) on the motor shaft.



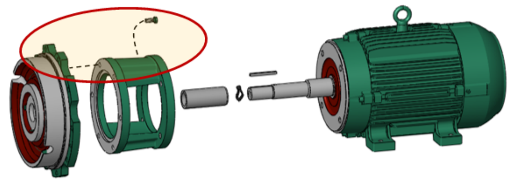
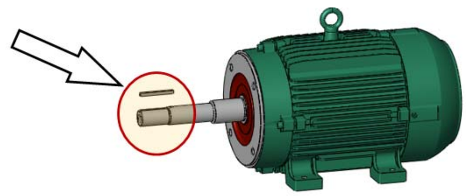
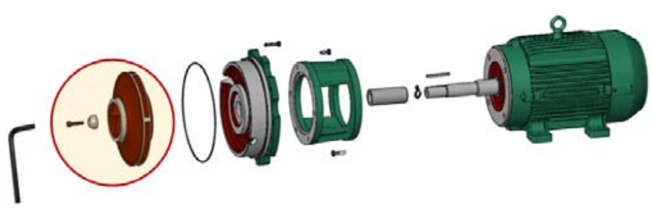
Step 5

Use bolts (item 120-1) to fix the bracket (item 803) to motor-flange



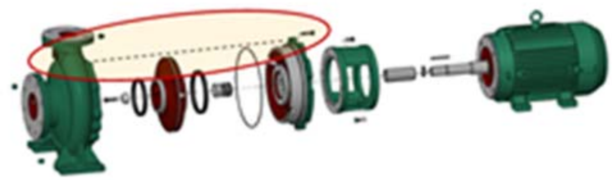
THD Assembly Instruction (Continued)

Pump Assembly – THD Closed Coupled

Step 6 Place the casing cover (item 011) on bracket (item 803). Use hex head bolts (item 120-2).	
Step 7 Insert the key (item 039) into motor shaft.	
Step 8 - A Insert the impeller wear ring (item 025) on the impeller (item 021), using a soft face hammer.	
Step 8 - B Place the impeller (item 021) on motor shaft using the impeller bolt (item 275) and bushing (item 080).	
Step 9 Insert the casing wear ring, (item 107) on casing (item 001) using a soft face hammer.	

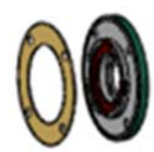
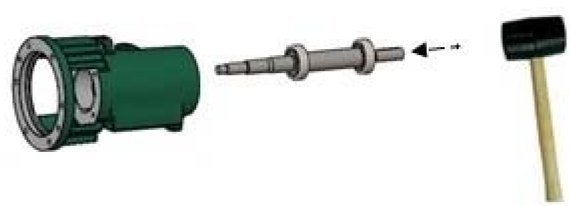
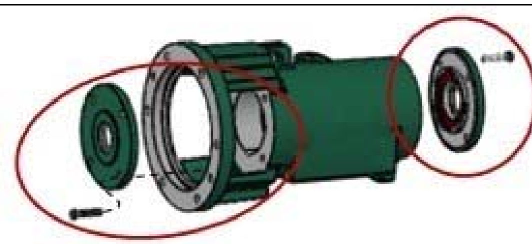
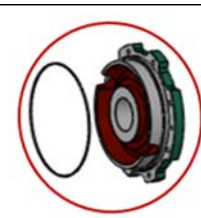
THD Assembly Instruction (Continued)

Pump Assembly – THD Closed Coupled

Step 10 - A	
Place the casing (item 001) on the casing cover (item 011). Fasten with hex head bolts (item 120-1)	

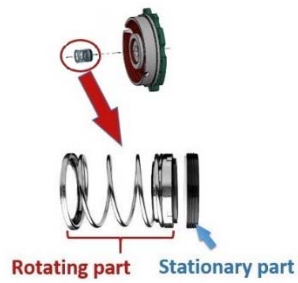
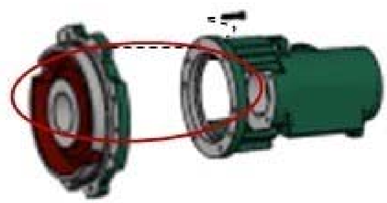
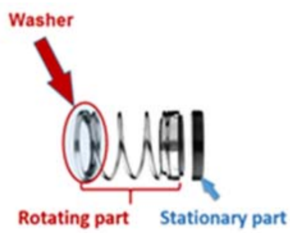
TH Assembly Instruction (Continued)

Pump Assembly – TH Frame Mounted

Step 1 Heat the bearings (item 849) to perform the assembly on the shaft (item 031). ***Note: If possible, we recommend using an induction heater to facilitate assembly of bearings.***	
Step 2 Place the gaskets (item 117) in the bearing cover (item 845). *Do not use any adhesive type to place the gasket (item 117).	 Gasket
Step 3 Install the shaft (item 031) with the bearings (item 849) into the bearing housing (item 051) according the illustration. Use soft face hammer to assemble.	
Step 4 Attach the bearing covers (item 845) and fasten the hex head bolts (item 120-3).	
Step 5 Fix O-ring (item 115) at case cover (item 011). Use grease to hold the O-ring in place. Do not use any kind of adhesive, this should cause chemical damage at rubber/elastomer.	

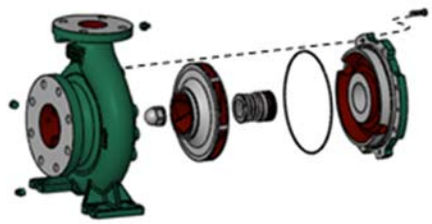
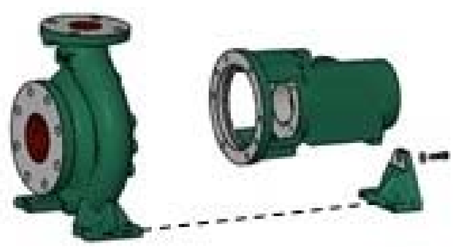
TH Assembly Instruction (Continued)

Pump Assembly – TH Frame Mounted

Step 6 Insert the stationary part of mechanical seal (item 696) into case cover (item 011) using grease or another type of lubricant. Use a soft face tool to avoid damages. After the stationary part is in place, clean the face with an alcohol wipe.	
Step 7 Use hex head bolts (item 120-1) to fix the case cover (item 011) to bearing housing (item 051).	
Step 8 Place the rotating part of the mechanical seal on the shaft sleeve (item 042), centring the washer to the impeller side.	
Step 9 Lubricate the rotating part with grease to facilitate assembly.	
Step 10 Place the shaft sleeve (item 042) and O-ring (item 115-2) on the shaft (item 031).	

THD Assembly Instruction (Continued)

Pump Assembly – TH Frame Mounted

Step 11 Insert the key (item 039) on the shaft (item 031).	
Step 12 Install the impeller (item 021). Lock the shaft in place and tighten the shaft nut (item 048) with Loctite.	
Step 13 Install the back-pull-out assembly in the casing (item 001). Install the casing bolts (item 120-2) and tighten them.	
Step 15 Attach the support (item 696) with hex head bolts (item 120-2) and flat washer (item 135). ***Note: Install the support (item 696) aligned with the pump casing (item 001).***	

Troubleshooting

⚠ WARNING

Service Work
Only certified personnel should perform service work on these pumps and motors.

Trouble	Possible Cause	Probable Remedy
Motor Fails to Start	Loss of supply voltage	Check voltage across all phases above circuit breakers
	Pump motor branch circuit breaker open or tripped	Check voltage below circuit breakers (all phases) with circuit breakers closed
	Overload trips are open	Push reset button
	Defective starter	Select manual operation and check voltage across starter coil. If correct voltage is measured and starter is not energized, coil is defective. If no voltage is measured, control circuit is open. (Also check with switch in AUTO)
	Loose or poor connections in control circuit	Make visual inspection of all connections in control circuit, or make spot circuit checks
	Poor contact	Open circuit breaker, close magnetic switch by hand and examine contactors and springs
	Open line circuit in control panel	Check voltage at T1-T2-T3; check magnetic contactor
	Leads improperly connected	Check lead numbers and connections
	Defective motor	Repair or replace motor

Troubleshooting

Trouble	Possible Cause	Probable Remedy
Motor fails to come up to speed	Low or incorrect voltage	Check voltage and T1, T2, and T3 in control panel and at motor leads
	Incorrect connection at motor	Check for proper lead connections at motor, compare with connection diagram on motor
	Mechanical overload	Check impeller setting. Check for a locked or tight shaft
	Hydraulic overload	**Check impeller setting. Check GPM against pump capacity and head**
Motor runs hot	Inadequate ventilation	Ensure adequate supply of fresh air. Check air blast through motor by feeling air discharge at bottom of motor
	Overload	Check load with ammeter
	Unbalanced supply voltage	Check supply voltage phases with voltmeter
Pump starts, runs short while, then stops	Pump jammed with debris causing overload condition	Free jammed pump
	Defective pump bearing or seals causing overload	Replace pump bearing and/or seals
	Defective pump motor causing overload	Replace pump motor
Pump motor runs but pump fails to deliver rated discharge	Pump or piping clogged	Correct and clean piping