



Tri-Clover®
Dual Stage Tri-Blender

Model DS3218

Service & Installation Manual



Tri-Clover Inc.

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Thank you for purchasing a Tri-Clover Product!

This manual contains installation, operation, cleaning and repair instructions, with parts lists, for Dual Stage Tri-Blenders manufactured by Tri-Clover Inc., Kenosha, Wisconsin. It also provides a troubleshooting chart to assist in determining blender malfunction.

READ THIS MANUAL carefully to learn how to service the Tri-Blender. Failure to do so could result in personal injury or equipment damage.

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SAFETY

IMPORTANT SAFETY INFORMATION

Safety is very important!

DO NOT attempt to modify any Tri-Clover product. To do so could create unsafe conditions and void all warranties. **DO NOT place any Tri-Clover product in an application where general product service ratings are exceeded.**

The following DANGER, WARNING, AND CAUTION signs and their meanings are used within these instructions.

	⚠ DANGER
	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. The word Danger is used in the most extreme cases.

	⚠ WARNING
	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. May also be used to alert against an unsafe operating or maintenance practice.

	⚠ CAUTION
	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Safety labels are placed on every Tri-Blender. Do not remove any labeling on any Tri-Clover product. Immediately replace any label that is missing.



Part Number 38-241

INTRODUCTION

DESCRIPTION

The Dual Stage Tri-Blender consists of two basic sections, the dry material section and the liquid material section.

The Dual Stage Tri-Blender is mounted on a base plate. It is mounted adjacent to the drive motor and is driven by belts running between pulleys under the base plate. The manually controlled Butterfly valve is standard equipment.

On this model, the connection ends, the diffuser and the suction tube, the inlet adapter, the casing, screens, washer, the impellers and backplate are made of 316 stainless steel. The hopper is made of 304 stainless steel. All of the tubes are fastened with quick couple Tri-Clamps for easy care and fast access. The four legs supporting the Tri-Blender are adjustable for easy leveling of the blender during installation.

BASIC OPERATION

The Tri-Blender basically consists of a centrifugal pump head and impeller mounted so that the normal suction port, or inlet, is pointed upward. The inlet piping consists of a patented tube-within-a-tube arrangement. This serves to keep the liquid and dry ingredients separated until they are in the mixing chamber. The tube-within-a-tube arrangement eliminates prewetting, one of the major problems of wet-dry mixing.

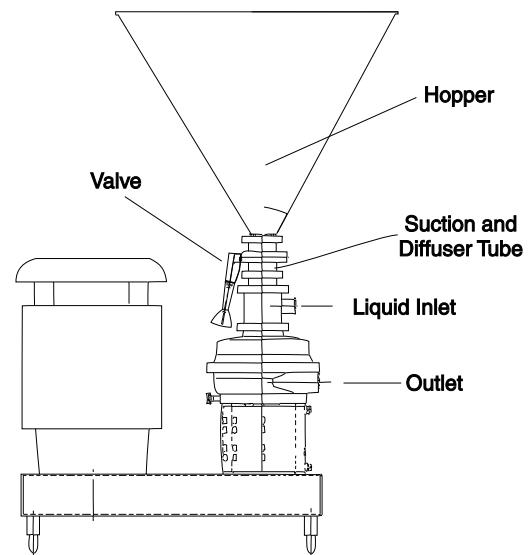
Our patented (U.S. Patent # 4,850,704) dual stage Tri-Blender incorporates the proven design characteristics of our popular Single Stage Tri-Blender, but takes the concept a step further for even more efficiency.

The Dual Stage concept provides for "double blending." The product passes through the initial liquid/dry ingredient blending chamber directly below to a secondary chamber, which effectively acts as a discharge pump.

Due to its close proximity, the dual (or second) chamber concept actually increases, rather than decreases vacuum. The vacuum from the suction of the second pumping stage is added to that of the first stage, greatly improving product addition rates. The "double blend" feature improves end product consistency, providing a smoother, more uniform blend.

With the Dual Stage, in applications up to 500 CPS and up to 50 feet (15m) of discharge head, no discharge pump is required. This is a significant improvement over the Single Stage units, which normally require an auxiliary discharge pump at 25 feet (7.5m) of discharge head and above. On some applications with higher CPS, a discharge pump may be necessary.

By incorporating the discharge pump function into the blender itself, you can achieve a significantly higher vacuum rates over a wider range of process conditions. The increased vacuum provides for fast, consistent product flow rates with no drop-off through your entire production run.



INSTALLATION

INSTALLATION GUIDELINES

UNPACKING EQUIPMENT

When unpacking your equipment, inspect all of the contents for damage that may have occurred during shipping. Report any damage to the carrier.

LOCATION AND INSTALLATION

The Tri-Blender unit should be located within 3 feet of the liquid source for best performance and in a position where the supply piping can be short and direct with a minimum number of elbows and fittings. The liquid to the blender must be supplied by an auxiliary source. It should also be readily accessible for cleaning and inspection.

The Tri-Blender unit is ready to install as received from the factory. A minimum space of 32" x 47" (81cm x 119cm) is required. Install the adjustable legs in the base of the unit and position the blender in the area it will be used. Turn the adjusting leg with a wrench and individually adjust the legs until the unit is level.

Attach the supply and discharge piping. Be sure that both the inlet and outlet tubes are correctly positioned and that supply and discharge piping are properly supported to avoid strain on the blender casing.

The tube OD of the inlet and outlet connections of the blender casing are:

Liquid Inlet	Liquid Outlet	Powder Inlet
1½" (38.1mm)	2" (50.8mm)	3" (76.2mm)

IMPORTANT: If your blender is equipped with the electrically controlled Butterfly valve, be sure the valve is wired to an auxiliary 110V power source. The auxiliary wiring will let the Butterfly operate independently from the blender motor and will allow the valve to be closed if the drive motor stops running. If the auxiliary 110V power source also fails, the Butterfly valve is equipped with a manual override to close (or open) the valve by applying a suitable size wrench to the flats on the coupling adapter.

INSTALLATION

PIPING HINTS

GENERAL

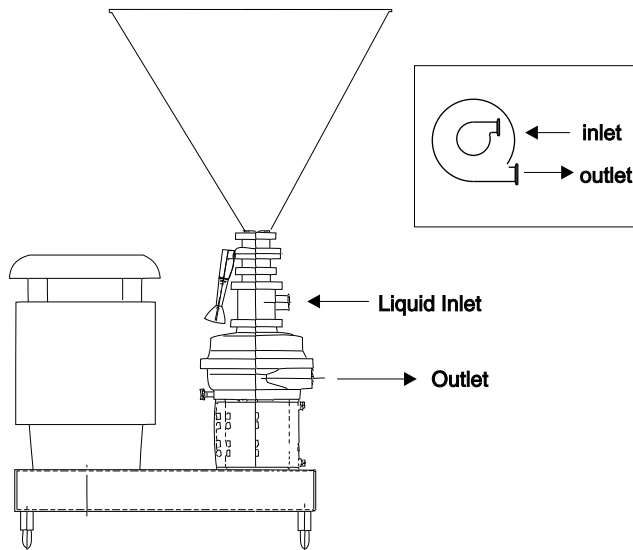
This section provides some hints on piping installation, which will aid in obtaining maximum efficiency and service from your Tri-Blender.

Piping should be independently supported at both the inlet and discharge outlet. Care should be taken that piping is properly aligned and does not put any strain on the Tri-Blender casing. The piping should have minimum line restriction.

INLET PIPING

The inlet piping should be short and follow a direct route with a minimum number of elbows and fittings. Elbows should not be used at the inlet as friction would be greatly increased, resulting in head loss. Excessive friction losses in the inlet line could cause cavitation in the blender casing, causing poor performance, noise, vibration, and damage to equipment.

Whenever practical, the diameter of the piping at the inlet should be increased in size. An eccentric tapered reducer should be used in lieu of a concentric tapered reducer to help direct the flow into the offset tee to minimize turbulence.



MAINTENANCE

CLEANING

C.I.P. CLEANING

The Dual Stage Tri-Blender can be cleaned in place. If the Tri-Blender is to be cleaned, the butterfly valve must be removed and cleaned separately. Refer to separate valve service manual. In addition, the dry ingredients inlet adapter tube must be capped off.

DISASSEMBLY

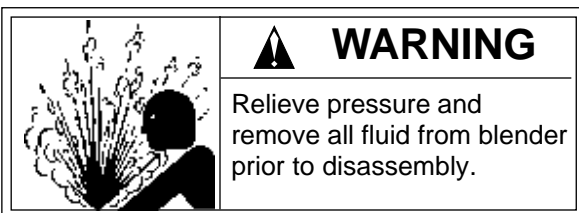
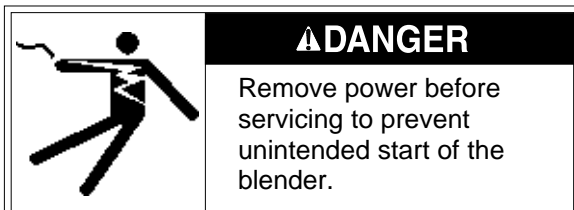
GENERAL

The Tri-Blender is relatively maintenance free, requiring normal cleaning and inspection to ensure optimum performance. Inspect all seals for cuts or abrasions and inspect seal faces for nicks and cracks. Replace worn or damaged parts as necessary.

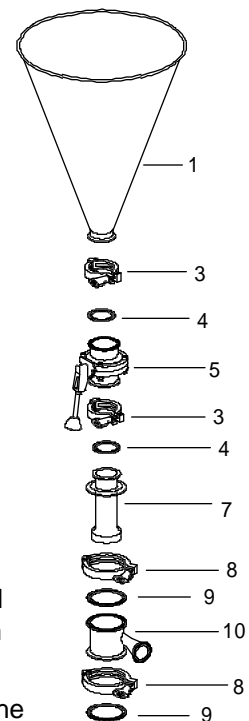
REPAIR INFORMATION

Repair of the Tri-Blender is normally accomplished by replacing defective parts. The only moving parts are the control valve, the impellers, the drive shaft, the seal, the belt, and the motor armature shaft. It is recommended that all parts of the Tri-Blender be periodically inspected to prevent malfunctions caused by worn or broken parts. For repair or replacement of the drive motor, refer to the motor manufacturer. For repair and service of the Butterfly valve on your blender, refer to *B Series Butterfly Valve Service and Installation Manual (B51SM)* available from Tri-Clover. Refer to the parts list for replacement data for the Tri-Blender parts.

TRI-BLENDER DISASSEMBLY



1. Remove the clamp (3) securing the hopper (1) to the blender and remove the hopper and gasket (4).
2. Remove the clamp (3) securing the control valve (5), and remove the valve and gasket (4). (Hold the valve while loosening the clamp to prevent the valve from falling.)
3. Remove the clamp (8) securing the diffuser and suction tube (7), and remove the diffuser and suction tube and gasket (9).
4. Remove the clamp (8) securing the inlet adapter (10), and remove the inlet adapter and gasket (9).



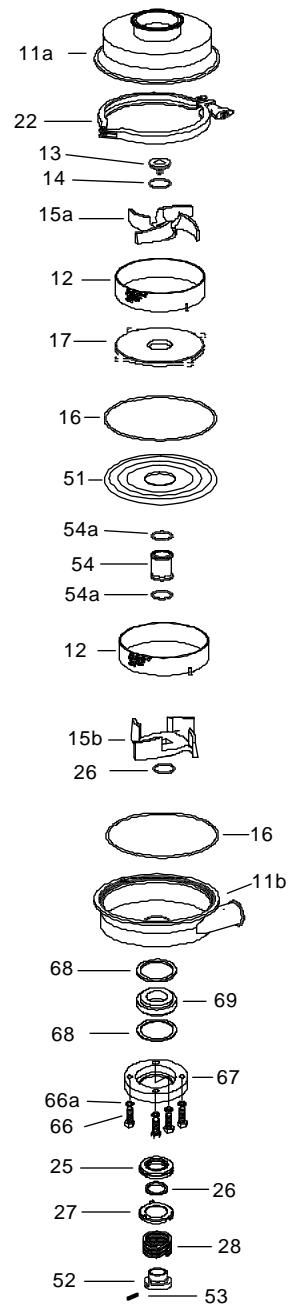
MAINTENANCE

- Remove the clamp (22) securing the upper casing (11a) to the lower casing (11b). Grasp the upper casing firmly in both hands and pull the casing straight up and off of the lower casing.

IMPORTANT: Do not use a tool to pry the casings apart. Any object inserted between the casing and gasket could cause damage to the gasket and casing sealing surface, resulting in leakage after reassembly.

- Remove and inspect the casing o-ring (16).
- Remove the upper screen (12).
- Using a suitable wrench remove the nut (13) securing the upper impeller (15a) to the stub shaft. Remove the impeller nut o-ring (14), upper impeller (15a), and backplate (17).
- Remove the diffuser plate (51) and lower o-ring (16).
- Remove the shaft sleeve (54) and o-rings (54a).
- Remove the lower impeller (15b), and lower screen (12).
- Remove the o-ring (26) from the lower impeller (15b).
- Loosen the three casing bolts, and lift the lower casing (11b) off of the adapter ring.
- Remove four screws (66) securing the seal gland (67) to the lower casing (11b). Inspect all parts of the seal for damage or wear and replace as required. For the DG seal, use caution when handling the casing to avoid damage to the surfaces around the opening for the carbon seal.
- Remove the carbon seal (25), o-ring seal (26), cup (27), spring (28) and drive collar (52) from the stub shaft. To remove the drive collar, loosen the setscrews (53) and lift the drive collar off of the shaft,

If you need to disassemble the stub shaft and motor, refer to *Stub Shaft and Motor Removal* following this section.

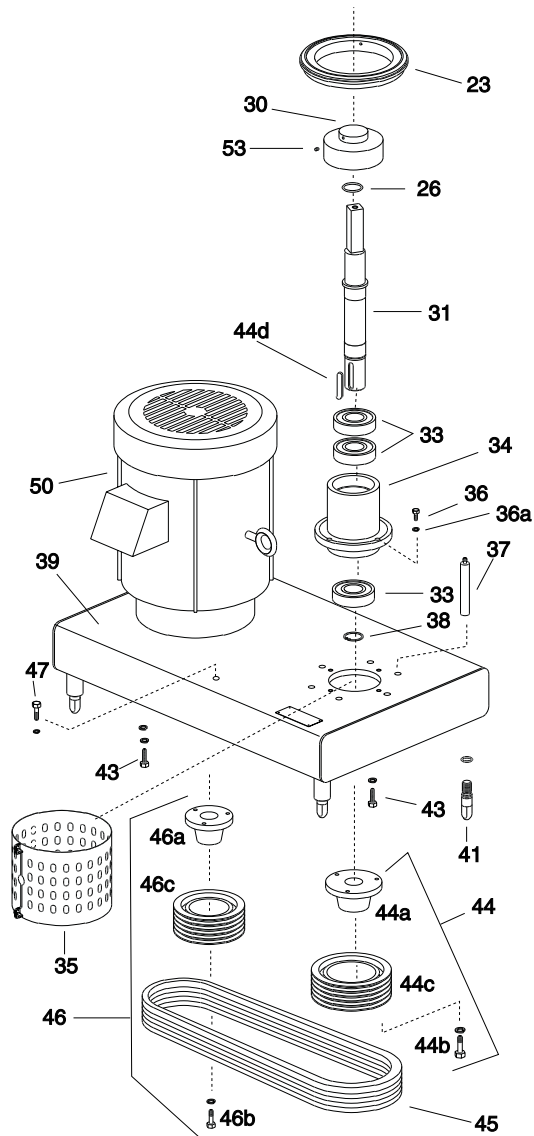


MAINTENANCE

STUB SHAFT AND MOTOR REMOVAL

Note: When removing drive components, it is necessary to tip the entire blender and base on its side, with the motor end toward the floor. Remove the hopper, valve, tubing, casing, impeller, seal guard and seal components before tipping to make the unit easier to lift.

1. Loosen the mounting bolts (43) securing the drive motor (50) to the base (39). (The bolt holes are elongated to permit belt adjustment.)
2. Slide the motor (50) toward the blender and remove the drive belts (45).
3. Remove the bolts (44b) securing the blender pulley (44c). Use the same bolts as a forcing screw and thread it into the forcing holes, finger tight.
4. With a suitable wrench, turn the bolt (44b) until the pulley (44c) releases from the bushing (44a). Remove the forcing screw and remove the pulley.
5. Slide tapered bushing (44a) from the shaft (31).
6. Loosen the set screws (53) securing the collar (30) to the shaft (31) and remove the deflector collar.
7. Loosen the six capscrews (43) securing the adapter ring spacers (37). Hold the adapter ring (23) to prevent it from falling. Remove the capscrews and remove the adapter and spacers.
8. Set the blender down on its legs (41). Remove the four capscrews (36) and lockwashers (36a) securing the bearing housing (34) to the base (39).
9. Grasp the bearing housing (34) firmly in both hands and lift it out of the blender base (39).
10. Remove the retaining ring (38) and press the shaft (31) out of the housing (34). Using a suitable puller, remove the bearing (33) from the shaft and remove the other bearing from the housing.
11. Inspect the shaft (31) sealing surface for nicks or scratches. Inspect all components for cracks and distortion. Inspect the adjusting legs for worn threads and inspect all o-rings for damage.
12. Replace any worn or damaged components.

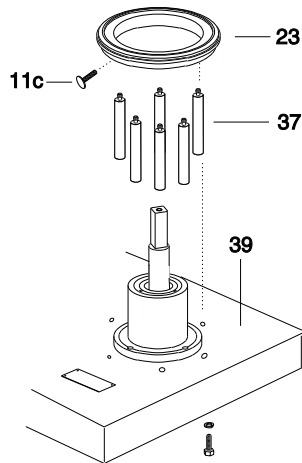
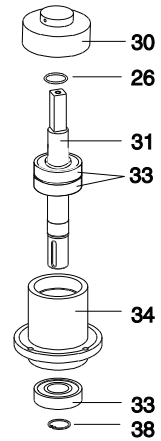


IMPORTANT: The three bearings in the bearing housing are sealed and lifetime lubricated. If either of the bearings are worn or damaged, make certain they are replaced with exactly the same type of bearings and replaced as a set.

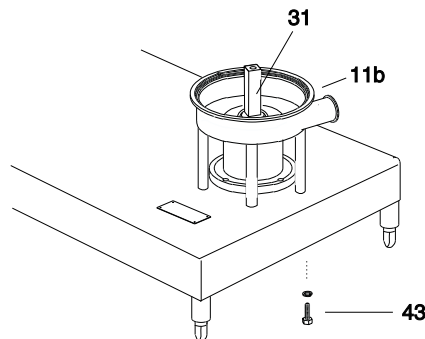
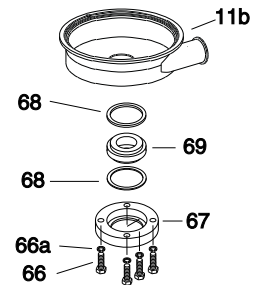
MAINTENANCE

REASSEMBLY

1. Install the o-ring (26) in the deflector collar (30).
2. Install two bearings (33) on the shaft (31) from the bottom until they rest against the shoulder.
3. Install the shaft into the bearing housing (34).
4. Install the other bearing (33) on the shaft (31) through the bottom of the housing (34).
5. Install the retaining ring (38) on the bottom of the shaft (31).
6. Install the bearing housing (34) on top of the base (39) and tighten the bolts.
7. Install the deflector (30) on top of the bearing housing (34).
8. Screw the six spacers (37) into the adapter ring (23), and bolt the spacers onto the baseplate (39).



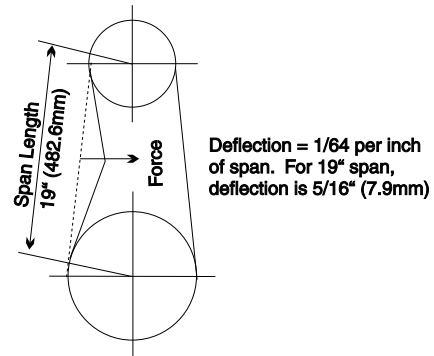
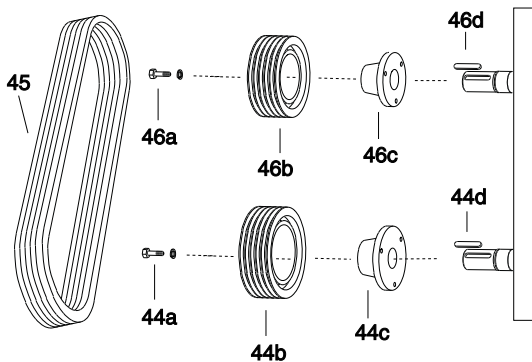
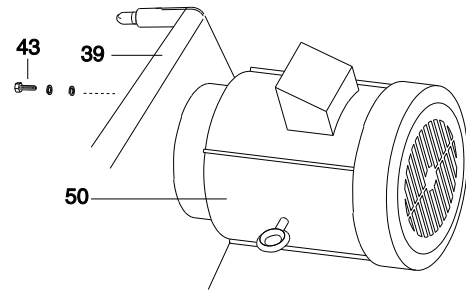
9. Install the DG insert into the gland ring with gaskets (68).
 Note: If you are using a stainless steel replaceable seat, you won't have an insert and you'll only use one gasket between the lower casing and the seat.
10. Install the lower casing (11b) over the shaft (31) and onto the adapter ring. Use the three casing bolts (11c, shown above) to secure the casing to the adapter ring.



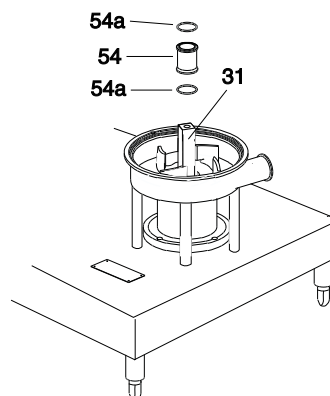
11. Alternately tighten the spacer bolts (37) to center the shaft (31) in the lower casing (11b).

MAINTENANCE

12. Tip the base on its side (39), and install the motor (50). Tighten the bolts enough so that they contact the bottom of the base. You'll use the bolts later to adjust the belt tension.
13. Install the blender pulley key (44d), pulley (44b), and bushing (44c) and tighten the bolts (44a). Place the pulley in position using the correct mounting holes for the bolts securing the pulley.

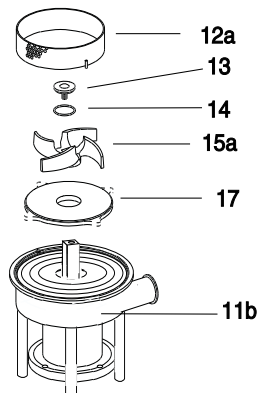
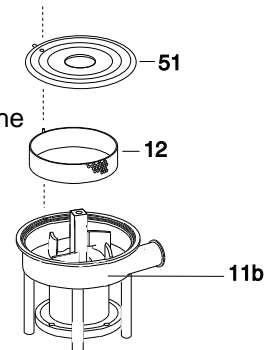
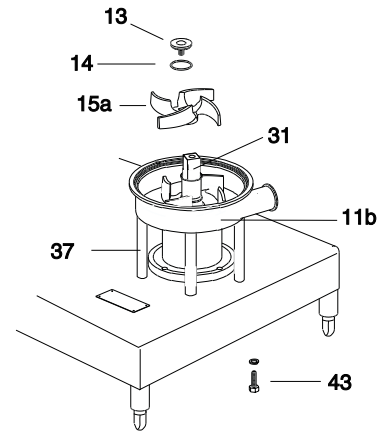


14. Install the motor pulley key (46d), pulley (46b), and bushing (46c) and tighten the bolts (46a). Make sure that both pulleys are horizontally aligned. Draw the pulley tight with the mounting bolts by alternately tightening each bolt a small amount until all three bolts are tight.
15. Place the drive belt (45) on the motor pulley (46b) and the blender pulley (44b). It may be necessary to move the motor toward the blender to place the belts on the pulleys. Tighten the belts by moving the drive motor away from the blender housing until there is a deflection of $\frac{5}{16}$ " (7.9 mm) using 5 to 7 pounds of force on the belt. Tighten the motor bolts.
16. Turn the blender upright.
17. Assemble the seal. Refer to *Setting the Drive Collar and Seal Replacement* section (all motors) at this point. Then return to Step 17.
18. Slide the lower impeller (15b) with the o-ring onto the shaft (31) and down into the lower casing (11b).
19. Slide the shaft sleeve (54) with two o-rings (54a) onto the shaft (31).



MAINTENANCE

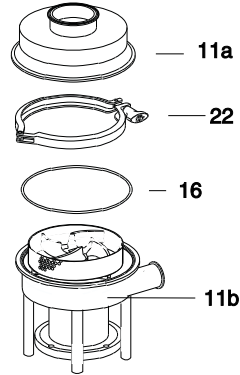
20. Install the upper impeller (15a) onto the shaft (31) with the impeller nut (13) and o-ring (14).
21. Loosen all spacer bolts (43) to set the clearance between the lower casing and the lower impeller.
22. Select three alternating adapter ring spacers (37) to adjust for a .015 to .020 inch clearance between the lower casing and the lower impeller. Adjust the spacers to obtain a level adjustment. Tighten the three spacers using the base plate screws (43) to secure the setting. Recheck the clearance to ensure proper adjustment.
23. Adjust the three remaining spacers (37) to take up the gap between the end of the spacer and the base plate. (Also takes up slack in the threads of the first 3 spacers to prevent casing movement due to thread clearances.)
24. Tighten the three remaining screws (43) of the spacer to the base plate connections.
24. Remove the upper impeller (15a).
25. Place the lower screen (12) inside the lower casing (11b) with the pin on the screen facing upward and lined up with the step in the lower casing.
26. Install the diffuser plate (51) on the lower casing (11b), ensuring that the pin in the plate fits in the notch in the lower casing. (The pin in the lower screen must also fit inside the notch on the diffuser plate.)
27. Install the back plate (17).



28. Install the upper impeller (15a) onto the shaft with the impeller nut (13) and o-ring (14).
29. Install the upper screen (12) with the pin down. Rotate the screen counterclockwise until it rests against one of the tabs on the back plate (17).

MAINTENANCE

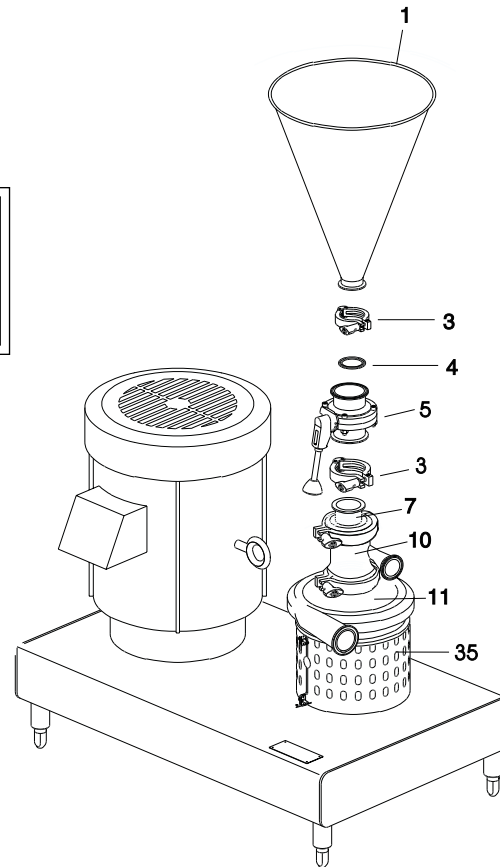
30. Install the upper casing with o-ring, ensuring that the pins on the upper casing fit into the notches on the lower casing, and install and tighten the clamp.



31. Install the seal guard (36).
32. Install the inlet adapter (10) on the casing (11), securing it with a clamp.

IMPORTANT: Be sure to position the adapter (10) correctly. The adapter inlet should be opposite the casing outlet (11). See figure at right.

33. Install the diffuser and suction tube (7) and gasket in the adapter (10), and secure it with a clamp.
34. Install the butterfly valve (5) and gasket, and secure it with a clamp (3).
35. Install the hopper (1) and gasket (4), and secure it with a clamp (3).

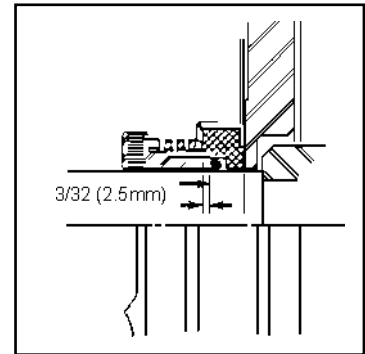


MAINTENANCE

SETTING THE DRIVE COLLAR AND SEAL REPLACEMENT

Complete these steps before returning to final reassembly steps in preceding section.

1. Slide the drive collar and seal assembly toward the seal seat until the nose of the drive collar pushes the o-ring and carbon seal tight against the seal seat.
2. Slide the drive collar away from the seal seat $1/32$ inch (0.8mm) and secure the drive collar in this location with the set screws.
3. Remove the impeller screw and the upper impeller.
4. Insert the lower impeller screen with the pin up to align with the hole in the diffuser.
5. Install the diffuser with an o-ring in the lower casing.
6. Install the backplate onto the diffuser.
7. Insert the upper impeller screen so the pin faces down and when rotated clockwise rests against one of the 4 tabs of the backplate.
8. Attach the upper impeller to the shaft with the impeller screw and o-ring.
9. Attach the upper casing and o-ring with the large Tri-Clamp to the lower casing while aligning the backplate tabs with the upper casing grooves.
10. Assemble the remaining tubes and seals securing each section with the proper size clamps.
11. With the blender assembled, and casing clamp tightened, if the drive collar is properly positioned, and the seal components are properly installed, the blender shaft should rotate freely by hand. If excessive effort is required to rotate the shaft, check to be sure that all components are properly installed and the drive collar is properly positioned.
12. Assemble seal guard and tighten nut.



After above setting instructions have been followed, return to the *Reassembly* section for final steps.

TROUBLESHOOTING

TROUBLESHOOTING GUIDELINES

Tri-Blenders are relatively maintenance free with the exception of sanitizing and inspection. Like any piece of machinery, however, occasional problems can arise. This section provides a means of determining and correcting most of your Tri-Blender problems. The motor manufacturer should be contacted for specific repair instructions on the motor.

The chart below has been prepared on the basis that the Tri-Blender, as installed, is properly suited to its application. Should problems arise where the remedies listed below chart do not cure the situation, impeller cavitation may be the problem. Symptoms of cavitation, such as noisy operation, insufficient discharge and vibration, can result when the auxiliary pump or suction tube are not properly applied. If these conditions are present, check the system and reevaluate the application. If assistance is required, contact Tri-Clover.

PROBLEM	PROBABLE CAUSE	REMEDY
1. No suction.	<ul style="list-style-type: none"> a. Wrong supply pump or need of discharge pump. b. Leak on the suction side of the supply pump or blender. c. Carbon seal is worn. d. Wrong direction of rotation. e. Inlet port on wrong side. f. Splashing in the suction throat of the Tri-Blender. g. High viscosity. h. High temperature. 	<ul style="list-style-type: none"> a. Verify that pumps are sized correctly to suit application. Contact Tri-Clover if you require assistance. b. Tighten all clamps, fittings - replace worn out gaskets. c. Replace carbon seal on blender and/or supply pump. d. Reverse a three phase motor by switching any of the three power leads at the motor or controller on blender or supply pump. e. Remove inlet adapter housing and relocate so it is correctly positioned as shown on the exploded view pages. f. High Flow - oversized supply pump; see 1a above; see 1e above. g. See 3b. h. Reduce temperature below 140°F (60°C).
2. Insufficient discharge.	<ul style="list-style-type: none"> a. High viscosity with screen in casing. b. No liquids. c. Product too viscous or discharge head too great. 	<ul style="list-style-type: none"> a. Remove screen. b. Check supply pump. c. Add discharge pump.

TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
3. Excessive power consumption.	a. High viscosity with screen in head.	a. Remove screen. b. Install discharge pump on discharge end of the Tri-Blender.
4. Tri-Blender is noisy.	a. Magnetic hum in motor. b. Motor bearings are worn. c. Tri-Blender bearings are worn. d. Foreign matter is rotating with impeller.	a. Consult motor manufacturer. b. Consult motor manufacturer. c. Replace bearings. d. Remove casing and remove foreign matter - inspect for damage. Check supply flow to blender.
5. Excessive vibration.	a. Blender is not leveled properly. b. Impeller is damaged. c. Foreign matter in casing.	a. Level blender. b. Replace impeller. c. Remove casing and remove foreign matter - inspect for damage.
6. Tri-Blender leaks.	a. Seal failure. b. Casing gasket worn or damaged.	a. Replace seal. b. Replace gasket.

PARTS LIST

MODEL DS3218

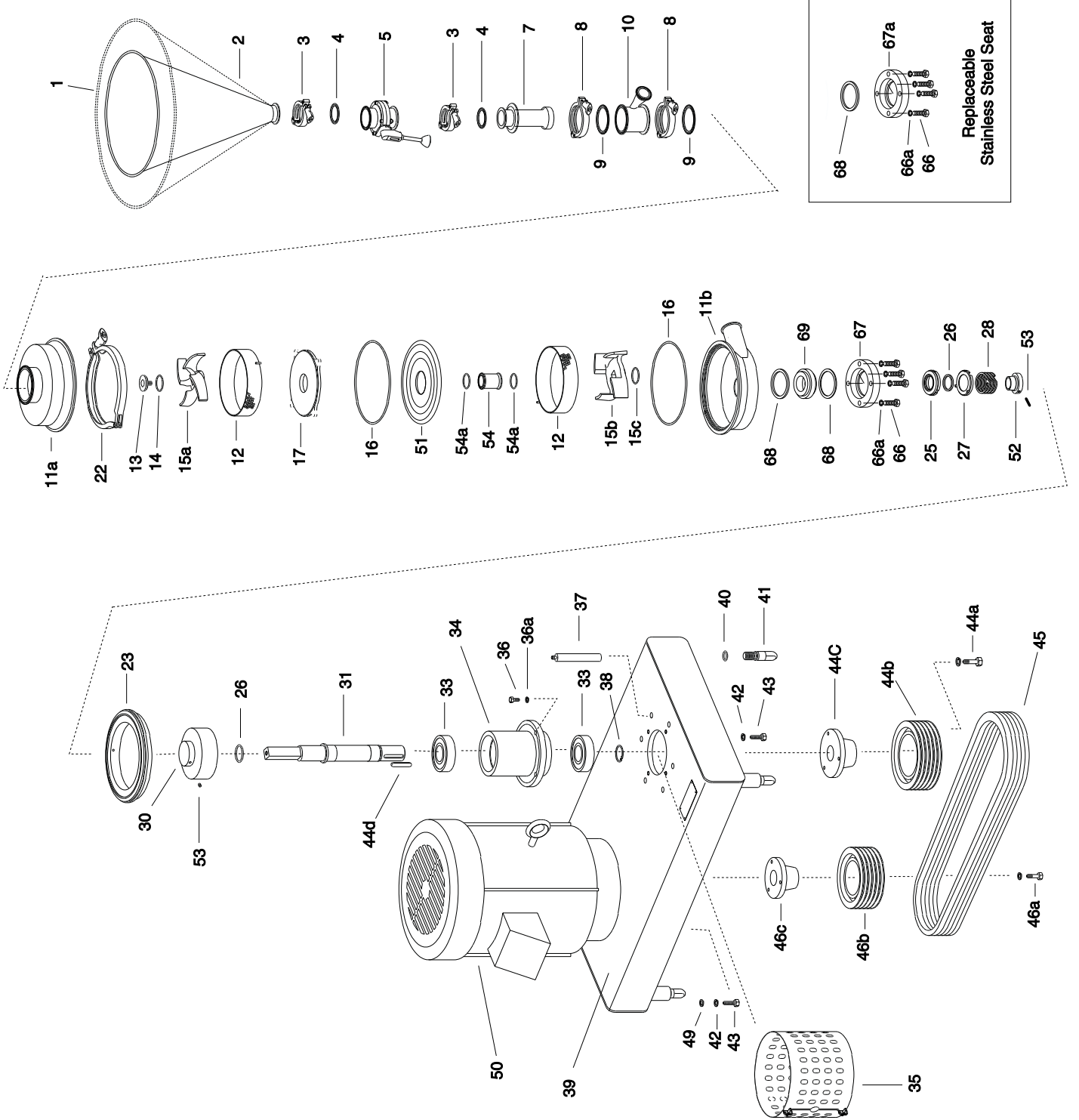
All orders for repair parts must contain the following data.

1. Complete model number (located on nameplate).
2. Tri-Blender serial number (located on nameplate).
3. Description and part key number from the parts list.

The exploded views and accompanying parts list facilitate ordering repair parts from the factory. All parts of the Tri-Blender are exploded and keyed to the parts list.

Key No.	Description	Part Number	Qty	Key No.	Description	Part Number	Qty
1	40° hopper	D3218-55-40-01	1	35	Seal Gaurd	F3218D-131-S	1
2	60° hopper	D3218-55-60-01	1	36	Screw, Bearing Housing	SC1510H-SS	5
3	Clamp	13MHM-2-S	2	36a	Lockwasher, Bearing Housing	LWA1500-SS	5
4	Gasket	40MP-U-2	2	37	Spacer	DS3218-71A-316L	6
5	Manual Butterfly Valve	B51A-4-E-S	1	38	Retaining Ring	DS3218-177	1
7	Difuser & Suction Tube	F3218-05-316	1	39	Base Plate	DS3218-23-S	1
8	Clamp	13MHM-4-S	2	40	O-Ring, Adjustable Leg	01-1154-13-34-U	4
9	Gasket	40MP-U-4	2	41	Adjustable Leg	R3-1-23-03-S	4
10	Inlet Adapter	F3218-217-316	1	42	Washer, Spacer & Motor	LWA1700-SS	10
11a	Upper Casing	DS3218-1B-01-316L	1	43	Screw, Spacer & Motor	SC1712H-SS	10
11b	Lower Casing	DS3218-1A-316L	1	44	Blender Pulley 50 Cycle	DS3218-106-5-3V5.0x1.500	1
12	Impeller Screen	DS3218-215-316	2	44	Blender Pulley 60 Cycle	DS3218-106-5-3V6.0x1500	1
13	Screw, upper impeller	DS3218-26-316L	1	44d	Blender Pulley Key	D3218-46	1
14	O-Ring, upper impeller	17-15-U	1	45	"V" Belt	D3218-3VX600	5
15a	Upper Impeller	DS3218-2B-02-316	1	46	Motor Pulley 50 Cycle	DS3218-108-5-3V8.0x1.875	1
15b	Lower Impeller	DS3218-2A-02-316	1	46	Motor Pulley 60 Cycle	DS3218-108-5-3V8.0x1.875	1
16	O-Ring, casing	17-327-U	2	49	Washer, Motor	WA1700-SS	4
17	Backplate	DS3218-11-316	1	51	Diffuser Plate	DS3218-5-316L	1
22	Clamp, Casing	DS3218-75-S	1	52	Drive Collar	SP328D-23P-S	1
23	Adapter Ring	DS3218-71-1-S	1	53	Setscrew	SC1105A-SS	1
25	Carbon Seal	328E-80-1A-Mat'l	1	54	Shaft Sleeve	DS3218-14-316L	4
26	O-Ring	S328-80-2-U	3	54a	O-Ring, Shaft Sleeve	17-51-U	1
27	Cup	328D-80-3P	1	66	Bolt, Gland Ring	SC1310H-SS	2
28	Spring	328D-80-4	1	66a	Lockwasher, Gland Ring	LWA1300-SS	4
30	Deflector	F3218-40E-S	1	67	Gland Ring (DG Seal)	SP328G-17-316L	4
31	Drive Shaft	DS3218-06-316L	1	67a	Stainless Steel Seat	DS3218-17-316L	1
33	Bearings	D3218-18	3	68	PTFE Gasket	SP328G-80-1-2-G	2
34	Bearing Housing	F4329-99-S	1	69	Seal Seat	SP328G-80-1-1-Mat'l	1

EXPLODED VIEW



Tri-Clover

manufactures

a complete line of

TRI-WELD® fittings

TRI-CLAMP® fittings

BEVEL SEAT fittings

POSITIVE PUMPS

CENTRIFUGAL PUMPS

AUTOMATIC Air Actuated VALVES

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AUTOMATED FLOW CONTROL SYSTEMS

Terms, Warranty Provisions, Notice of Claims and Limitation of Liability

Prices and all terms and conditions of sale are established in current price sheets and are subject to change without notice. All orders are subject to acceptance by Tri-Clover Inc. at its Kenosha, Wisconsin or Distribution Center* offices only. No assignment of the purchaser's rights may be made without consent of Tri-Clover Inc.

Each Tri-Clover item is warranted to be free from manufacturing defects for a period of one (1) year from the date of shipment, providing it has been used as recommended and in accordance with recognized piping practice, and providing it has not been worn out due to severe service, such as encountered under extremely corrosive or abrasive conditions.

This warranty is expressly in lieu of any other warranties, express or implied, including but not limited to, any implied warranty of merchantability or fitness for a particular purpose.

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and within the time period specified above shall be deemed waived.

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**Distribution Centers in Union City, California and St. Charles, Missouri.*



Tri-Clover Inc.

Food & Dairy Division
9201 Wilmot Road
Kenosha, Wisconsin 53141-1413
PHONE: 1-800-242-4000
FAX: 414-694-7104

Distribution Centers
St. Charles, MO
PHONE: 1-800-238-0142
Union City, CA
PHONE: 1-800-852-3178

Bio-Pharm Division
PHONE: 1-800-511-5444
FAX: 414-694-2454

Tri-Clover Canada
101 Milner Avenue
Scarborough, Ontario M1S4S6
PHONE: 416-297-3400
FAX: 416-299-5095

Export Division
PHONE: +1-314-447-1555
FAX: +1-314-447-1447

Tri-Clover Mexico
Recursos Petroleros No. 7
Fracc. Ind. La Loma
54060 Tlalnepantla, Edo. de Mexico
PHONE: 52-5-397-0601
FAX: 52-5-362-3246

E-mail address: TCWEBMASTER@alfalaval.com
Visit our web site at www.tri-clover.com