

4-Ball Lowers

3A0539M

750cc, 1000cc, 1500cc, and 2000cc Models

EN

**Designed for low pressure, high volume circulation of finishing materials.
Do not use for flushing or purging lines with caustics, acids, abrasive line strippers, and other similar fluids. For professional use only.**

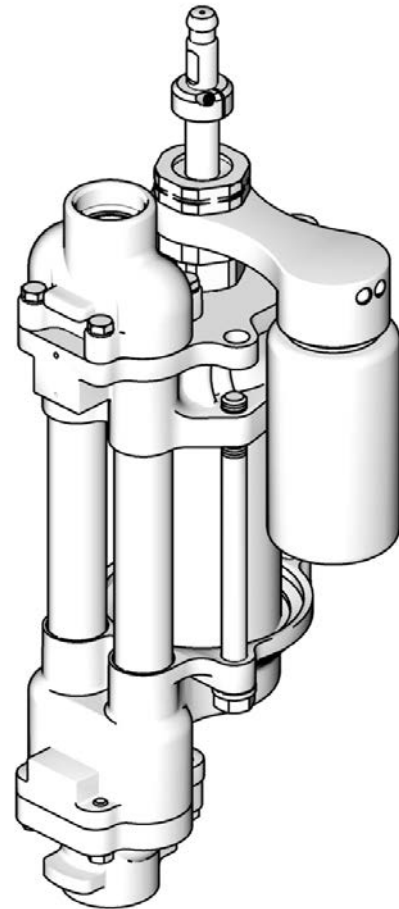


Important Safety Instructions

Read all warnings and instructions in this manual and in your separate pump manual. Save these instructions.

See page 2 for model information, including maximum working pressure.

For patent information, see www.graco.com/patents.



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Models

750cc Lowers

Model No.	Series	Material	Maximum Pump Working Pressure psi (MPa, bar)	Rod/Cylinder Material	Packings	Inlet/Outlet Fitting Size and Type	Parts Page
24F413	A	SST	460 (3.2, 32)	Chromex™/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	18
24F414	A	SST	460 (3.2, 32)	Chromex™/ Ultra-Life™	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	18
24F420	A	CST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	18
24F415	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	1-1/2 in. tri-clamp	18
24F416	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	1-1/2 in. tri-clamp	18
24F417★	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	1-1/2 in. tri-clamp	18
24F418★	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	1-1/2 in. tri-clamp	18
24F446★	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	1-1/2 in. tri-clamp	21
Drum Size Lowers, with open wet-cup							
24F421	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	18
24F422	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	18
24F423	A	CST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	18

★ These models are for use with Graco E-Flo Pumps only.

1000cc Lowers

Model No.	Series	Material	Maximum Pump Working Pressure psi (MPa, bar)	Rod/Cylinder Material	Packings	Inlet/Outlet Fitting Size and Type	Parts Page
24F424	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	22
24F425	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	22
24F431	A	CST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	22
24F426	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	1-1/2 in. tri-clamp	22
24F427	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	1-1/2 in. tri-clamp	22
24F428★	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	1-1/2 in. tri-clamp	22
24F429★	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	1-1/2 in. tri-clamp	22

1500cc Lowers

Model No.	Series	Material	Maximum Pump Working Pressure psi (MPa, bar)	Rod/Cylinder Material	Packings	Inlet/Outlet Fitting Size and Type	Parts Page
24F432	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	24
24F433	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	24
24F439	A	CST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	24
24F434	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	1-1/2 in. tri-clamp	24
24F435	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	1-1/2 in. tri-clamp	24
24F436★	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	1-1/2 in. tri-clamp	24
24F437★	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	1-1/2 in. tri-clamp	24

2000cc Lowers

Model No.	Series	Material	Maximum Pump Working Pressure psi (MPa, bar)	Rod/Cylinder Material	Packings	Inlet/Outlet Fitting Size and Type	Parts Page
24F440	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	26
24F447	A	CST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	26
24F441	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	1-1/2 in. tri-clamp	26
24F442	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	1-1/2 in. tri-clamp	26
24F443	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	Inlet: 1-1/2 in. npt Outlet: 1 in. npt	26
24F444★	A	SST	460 (3.2, 32)	Chromex/Chrome	UHMWPE/Leather	1-1/2 in. tri-clamp	26
24F445★	A	SST	460 (3.2, 32)	Chromex/Ultra-Life	UHMWPE/Leather	1-1/2 in. tri-clamp	26

★ These models are for use with Graco E-Flo Pumps only.

4-Ball Lowers Cross Reference Chart

This chart cross references earlier styles of 4-ball lowers to the current lowers, which include the TSL pump and spring loaded packings.

NOTE: Replacing an earlier lower with a current lower may require a retrofit connection kit, depending on the motor used on your pump. See connection kit manual 311876 to order the correct kit for your lower and motor, if required.

Earlier Lower Part No.	Current Lower Part No.
15D787	24F432
220547	24F420
220549	24F431
220551	24F439
220553	24F413
220555	24F424
220557	24F432
237220	24F413
237221	24F420
239816	24F432
239820	24F413
239833	24F420
239834	24F431
239835	24F439
239836	24F413
239837	24F424
239838	24F432
239859	24F413
239860	24F420
240606	24F434
240607	24F432





Earlier Lower Part No.	Current Lower Part No.
240608	24F426 24F428★
240609	24F424
240610	24F415 24F417★
240611	24F413
240612	24F415 24F417★
240613	24F413
253033	24F424
253034	24F432
253035	24F440
253061	24F431
253062	24F439
253063	24F447
253085	24F432
253086	24F440
253396	24F443
253397	24F433
253398	24F425







Earlier Lower Part No.	Current Lower Part No.
253423	24F424
253520	24F426 24F428★
253521	24F434 24F436★
253522	24F441 24F444★
253523	24F427 24F429★
253524	24F435 24F437★
253525	24F442 24F445★
253568	24F425
253569	24F433
253570	24F443
289366	24F415 24F417★
686679	24F413

★ These models are for use with Graco E-Flo Pumps only. When replacing an earlier style lower with a current lower on an E-Flo pump, both lowers on the unit must be replaced.

Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

 WARNING	
	<p>FIRE AND EXPLOSION HAZARD</p> <p>Flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> • Use equipment only in well ventilated area. • Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc). • Keep work area free of debris, including solvent, rags and gasoline. • Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present. • Ground all equipment in the work area. See Grounding instructions. • Use only grounded hoses. • Hold gun firmly to side of grounded pail when triggering into pail. • If there is static sparking or you feel a shock, stop operation immediately. Do not use equipment until you identify and correct the problem. • Keep a working fire extinguisher in the work area. <p>Static charge may build up on plastic parts during cleaning and could discharge and ignite flammable vapors. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> • Clean plastic parts only in a well ventilated area. • Do not clean with a dry cloth. • Do not operate electrostatic guns in equipment work area.
	<p>PRESSURIZED EQUIPMENT HAZARD</p> <p>Fluid from the gun/dispense valve, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury.</p> <ul style="list-style-type: none"> • Follow the Pressure Relief Procedure when you stop spraying and before cleaning, checking, or servicing equipment. • Tighten all fluid connections before operating the equipment. • Check hoses, tubes, and couplings daily. Replace worn or damaged parts immediately.
	<p>TOXIC FLUID OR FUMES HAZARD</p> <p>Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.</p> <ul style="list-style-type: none"> • Read MSDSs to know the specific hazards of the fluids you are using. • Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

 WARNING	
	<p>PERSONAL PROTECTIVE EQUIPMENT</p> <p>You must wear appropriate protective equipment when operating, servicing, or when in the operating area of the equipment to help protect you from serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. This equipment includes but is not limited to:</p> <ul style="list-style-type: none"> • Protective eyewear, and hearing protection. • Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.
 	<p>EQUIPMENT MISUSE HAZARD</p> <p>Misuse can cause death or serious injury.</p> <ul style="list-style-type: none"> • Do not operate the unit when fatigued or under the influence of drugs or alcohol. • Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See Technical Data in all equipment manuals. • Use fluids and solvents that are compatible with equipment wetted parts. See Technical Data in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request MSDS from distributor or retailer. • Do not leave the work area while equipment is energized or under pressure. Turn off all equipment and follow the Pressure Relief Procedure when equipment is not in use. • Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only. • Do not alter or modify equipment. • Use equipment only for its intended purpose. Call your distributor for information. • Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces. • Do not kink or over bend hoses or use hoses to pull equipment. • Keep children and animals away from work area. • Comply with all applicable safety regulations.
 	<p>MOVING PARTS HAZARD</p> <p>Moving parts can pinch, cut or amputate fingers and other body parts.</p> <ul style="list-style-type: none"> • Keep clear of moving parts. • Do not operate equipment with protective guards or covers removed. • Pressurized equipment can start without warning. Before checking, moving, or servicing equipment, follow the Pressure Relief Procedure and disconnect all power sources.

Changing the TSL

Check the condition of the TSL and the level in the reservoir every week, minimum. TSL should be changed at least every month.

Part No. 206995 Throat Seal Liquid (TSL) carries residue from the pump rod into the reservoir. Discoloration of the TSL fluid is to be expected during normal operation. After some time the TSL will thicken and darken, and must be replaced. Thick, dirty TSL will not pump through the lines and will harden in the pump wet-cup.

How long TSL lasts depends on which chemicals are used, how much is used, what pressure, and condition of the pump seal and rod.

A drop in the level of TSL in the reservoir indicates that the throat packings are starting to wear. Add TSL to the reservoir and keep the level above the Minimum fill line. Monitor the usage and condition of the TSL. If pumped material bypasses the throat packings and enters the TSL reservoir, replace the packings.

To change the TSL:

1. Shut off the pump.

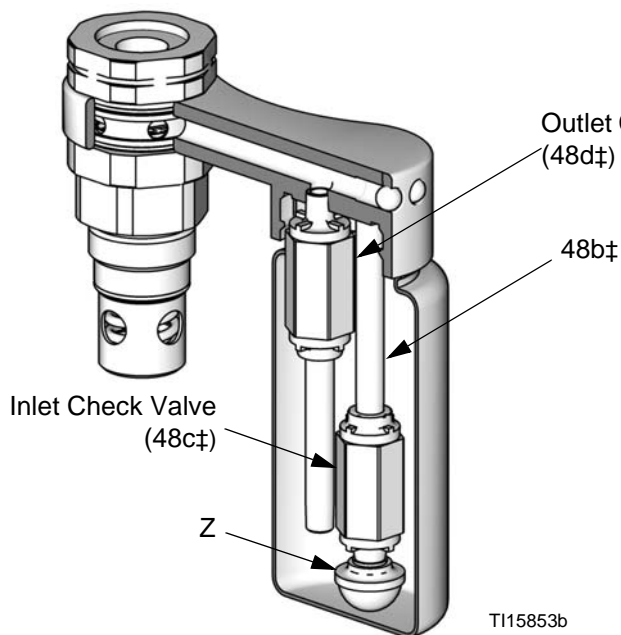


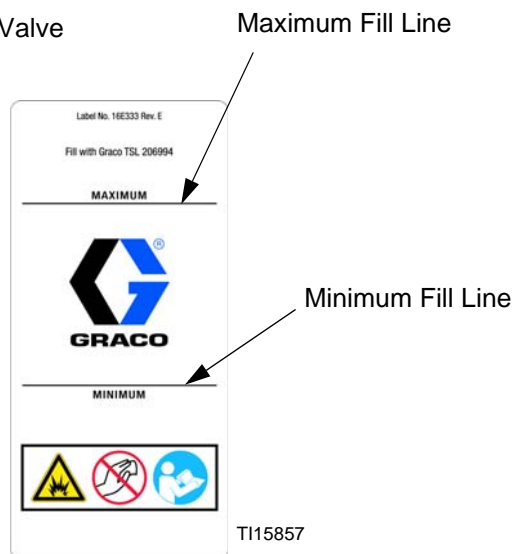
FIG. 1. Cutaway of TSL Reservoir, and Fill Lines

To avoid the buildup of static charge, do not rub the plastic bottle with a dry cloth while it is attached to the pump. Remove the bottle to clean, if needed.						

2. Remove and empty the reservoir bottle. Clean any residue.
3. Clean screen (Z) of inlet check valve (48c‡). If check valves are not sealing and dirty TSL is getting into the wet-cup, replace the check valves (48c, 48d). See FIG. 1.

NOTE: Order Check Valve Repair Kit 24F404. Kit parts are marked with a symbol, for example (48b‡).

4. Fill the reservoir to the Maximum fill line with Throat Seal Liquid (TSL).
5. Run pump. Each time pump rod reaches bottom of stroke, check that some TSL is pumped from reservoir through wet-cup and back to reservoir.



Repair

Replace the Throat Packings Without Disconnecting the Lower

NOTE: Throat packing kits are available. See page 28. Kit parts are marked with a symbol, for example (19†). For best results, install the TSL Pump Repair Kit 24F617 each time the throat packings are changed.

NOTE: To replace the throat packings as part of a complete service of the lower, see page 11.

NOTE: Tool Kit 24F494 is available as an accessory. The kit includes two wrenches for use with the wet-cup (41) and throat cartridge (40).

1. Flush the pump, if possible.
2. Stop the pump at the middle of its stroke.



3. Relieve the pressure. See your separate pump manual.
4. Following the instructions in your separate pump manual, remove the 2-piece shield covering the coupling assembly. Unscrew the coupling nut from the motor shaft. Lift the motor shaft and remove the coupling nut and collars.
5. See FIG. 4. Remove the collar (50) and screws (51), cap (49), and manifold and bottle assembly (48).
6. Remove the wet-cup (41) and o-ring (42). Remove the TSL pump piston seal (46◆), spring (45◆), and o-rings (47◆).
7. Remove the throat cartridge (40). Remove the o-ring (35), glands (19, 26), packings (20, 25), and spring (43).

NOTE: Inspect the surface of the piston rod (17). If it is scratched, replace the piston rod.

8. Lubricate the throat packings and glands. Install the spring (43) and one male gland (19†) in the throat cartridge (40), then five v-packings with the lips facing down: one UHMWPE (20†), one leather (25†), UHMWPE, leather, UHMWPE. Install the female gland (26†). Install three v-packings with the lips facing up: UHMWPE, leather, UHMWPE. Install the other male gland (19†).
9. Lubricate the o-ring (42†) and install it on the wet-cup (41). Install the wet-cup finger-tight.
10. Install the o-ring (35†) on the throat cartridge (40). Apply lubricant to the throat cartridge threads then screw the cartridge into the outlet housing (16).
11. Torque the cartridge (40) to 95-100 ft-lb (129-135 N•m).
12. Torque the wet-cup (41) to 70-75 ft-lb (95-102 N•m).
13. Reassemble the spring (45◆), TSL pump piston seal (46◆), and o-rings (47◆).
14. Reassemble the manifold and bottle assembly (48), cap (49), collar (50) and screws (51). Torque the cap (49) to 25-30 ft-lb (34-40 N•m).
15. Reinstall the coupling nut and collars on the piston rod (17).
16. Reconnect the coupling nut to the motor shaft. See your separate pump assembly manual for correct torque specifications for your model. Reinstall the shield.

TSL Pump Repair (if present)

Table 1: TSL Pump Troubleshooting

Problem	Cause	Solution
TSL pump not pumping TSL fluid.	Plugged manifold (48a).	Clear the manifold. Verify that the manifold is clear by blowing compressed air through the opening.
	Plugged check valves (48c, 48d).	Clear obstruction in check valves.
	Plugged inlet strainer (48c).	Clear strainer mesh.
	Damaged TSL pump piston (46).	Replace TSL pump piston.

NOTE: TSL Pump Repair Kit 24F617 is available. See page 28. Install the TSL Pump Repair Kit 24F617 each time the throat packings are changed. Kit parts are marked with a symbol, for example (46♦).

- 1. Follow steps 1-6 under **Replace the Throat Packings Without Disconnecting the Lower**, page 9.
- 2. Clean all parts and inspect for damage.
- 3. Follow steps 12-16 under **Replace the Throat Packings Without Disconnecting the Lower**.

Shield Disassembly/Reassembly

Some lowers include shield kits in multiple sizes. The correct size is determined by your lower and motor. See manual 406876 to select the correct size kit for your lower and motor.

See FIG. 2. Remove the 2-piece shield (52) by inserting a screwdriver straight into the slot, and using it as a lever to release the tab. Repeat for all tabs. **Do not** use the screwdriver to pry the shields apart.

Install the shields (52) by engaging the bottom lips with the groove in the wet-cup cap (49). Snap the two shields together.

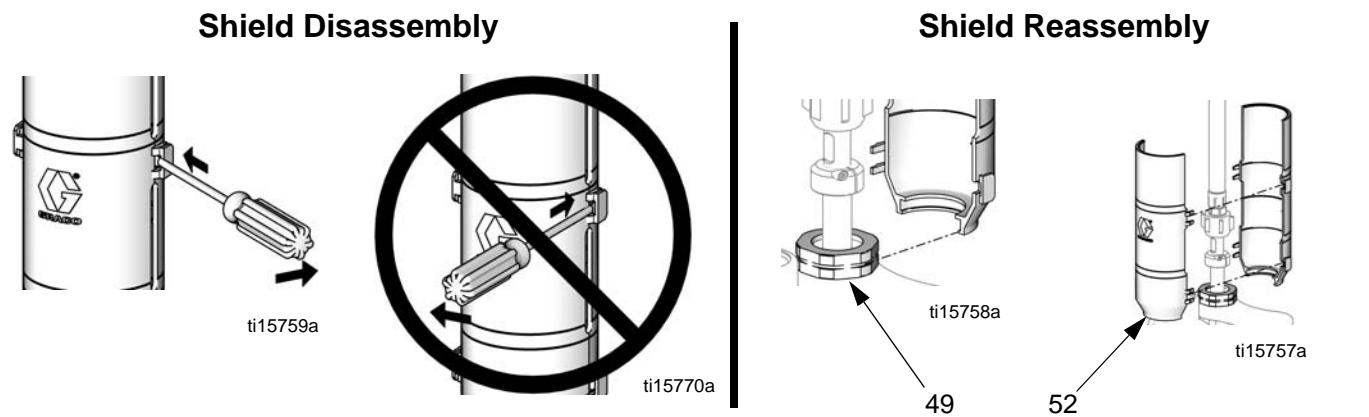


FIG. 2. Disassembly and Reassembly of the Shields

Lower Disassembly

NOTE: Seal kits are available for each lower size. See page 28. Kit parts are marked with an asterisk in the text and drawings, for example (2*).

NOTE: Throat packing kits are available. See page 28. Kit parts are marked with a symbol, for example (19†). For best results, install the TSL Pump Repair Kit 24F617 each time the throat packings are changed.

NOTE: Tool Kit 24F494 is available as an accessory. The kit includes two wrenches for use with the wet-cup (41) and throat cartridge (40).

NOTE: Complete pump repair kits are also available. The kits include all seal kit parts, throat packing kit parts, and TSL pump repair kit parts. See page 28.

1. Flush the pump, if possible.
2. Stop the pump at the middle of its stroke.



3. Relieve the pressure. See your separate pump manual.
4. Remove the lower from the motor as described in your separate pump manual.

NOTE: See FIG. 4 for an exploded view of the entire lower. See FIG. 5 for a cutaway view of the lower and an exploded view of the throat packings and TSL pump.

5. Remove the collar (50) and screws (51), cap (49), and manifold and bottle assembly (48).

NOTE: To replace the check valves in the TSL bottle, order Check Valve Repair Kit 24F404. Kit parts are marked with a symbol, for example (48b†). To replace the bottle only, order Bottle Replacement Kit 24F405. Kit parts are marked with a symbol, for example (48e*). The kit includes 5 bottles and 5 labels. See FIG. 1, FIG. 4, and FIG. 5.

6. Secure the inlet manifold (18) in a vise.
7. Loosen, but do not remove, the wet-cup (41) and cartridge (40).
8. Remove the four capscrews (9) and washers (8) from around the outlet manifold (22).
9. Remove the outlet manifold (22), balls (23), seats (24), and gaskets (7).
10. Remove the wet-cup (41) and o-ring (42). Remove the TSL pump piston seal (46), spring (45), and o-rings (47).
11. Remove the throat cartridge (40). Remove the o-ring (35), glands (19, 26), packings (20, 25), and spring (43).
12. Remove the three cylinder screws (13) and lock-washers (14). Lift off the outlet housing (16).

NOTE: The fluid tubes (3), cylinder (1), and piston assembly (17, 10, 11, 44, 12) may come loose with the outlet housing, or may remain in place on the inlet housing (15).

13. Remove the tubes (3) and cylinder (1). Pull the piston assembly out of the cylinder. Inspect the surface of the piston rod (17) and the inside surfaces of the cylinder and tubes. If any of these parts are scratched or damaged, replace them.
14. Remove the inlet manifold (18) from the vise.
15. Remove the four capscrews (9) and washers (8) from the inlet manifold (18).

NOTE: One inlet seat (6) includes a pressure relief valve. See FIG. 3. This seat must be located exactly where shown (the left side as viewed in FIG. 4). Use the text cast into the inlet housing as a guide.

16. Remove the balls (5), inlet seats (6 and 33), and gaskets (7).

NOTICE

Be careful not to drop or damage the balls (5) or seats (6 and 33). A damaged ball or seat cannot seal properly and the pump will leak. One inlet valve seat (33) can be reversed to provide longer use of the seat. However, the fluid inlet seat (6) contains a pressure relief valve and is not reversible. See FIG. 3 for proper orientation.

17. Inspect the pressure relief valve in the seat (6) to make sure it is not clogged. Press down on the valve's ball to see if the ball and the spring are free to move. See FIG. 3.

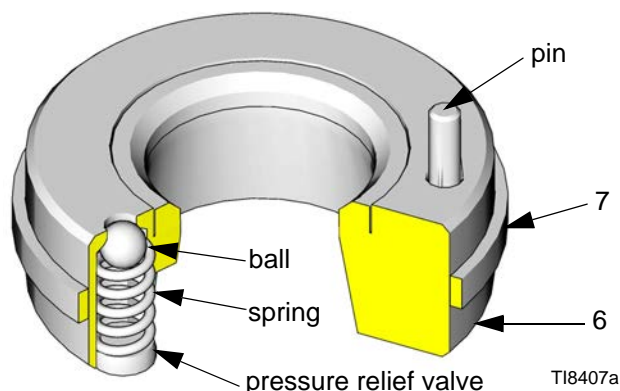


FIG. 3. Inlet Seat with Pressure Relief Valve

NOTICE

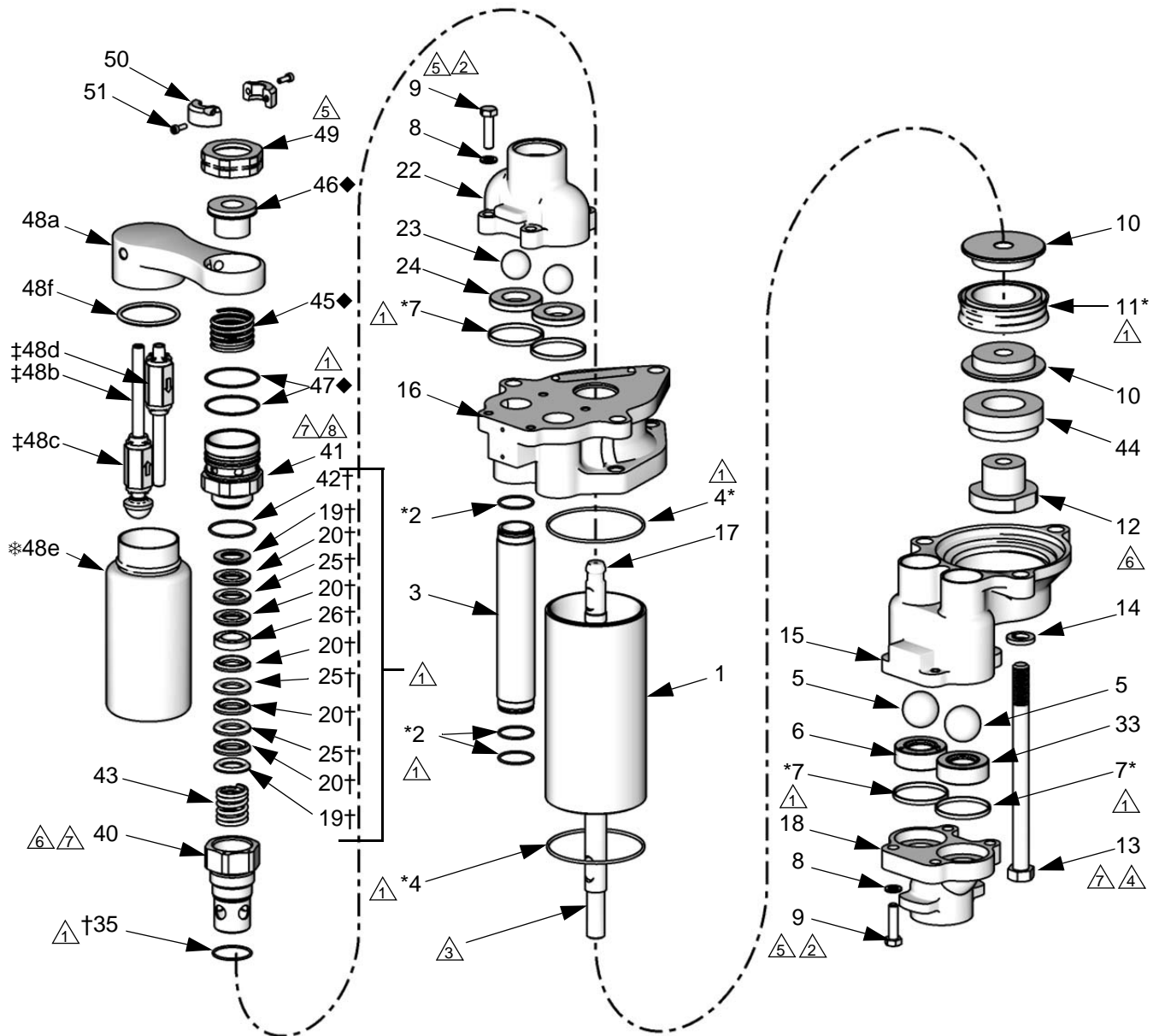
If the pressure relief valve in the seat (6) is clogged or filled with material, soak the seat in a compatible solvent. Make sure all material residue is cleaned from the ball and seat area.

If the relief valve cannot be thoroughly cleaned so that the ball and spring are free to move, replace the seat (6).

18. Place the flats of the piston nut (12) in a vise. Unscrew the rod (17) from the nut. Remove the spacer (44). Disassemble the piston (10) and remove the seal (11).

NOTE: The piston spacer (44) is not present on 750cc lowers.

19. Clean all parts in a compatible solvent. Inspect all parts for wear or damage. If you are using a repair kit, use all the new parts in the kit, discarding the old ones they replace. Replace any other parts as needed. Worn or damaged parts may cause the pump to perform poorly or cause premature wear of the new seals and packings.



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- △ Apply lubricant to all packings and seals.
- △ Apply removable (blue) Loctite® 243 to entire length of threads.

- △ Apply high strength (red) Loctite® 263 or 2760 to entire length of threads. Sealant must be allowed to cure for a minimum of 12 hours before use.
- △ Tighten uniformly until cylinder (4) is seated. Torque to 25-30 ft-lb (34-40 N•m).

- △ Torque 25-30 ft-lb (34-40 N•m).
- △ Torque 95-100 ft-lb (129-135 N•m).
- △ Apply thread lubricant.
- △ Torque 70-75 ft-lb (95-102 N•m).

FIG. 4. Exploded View of Lower

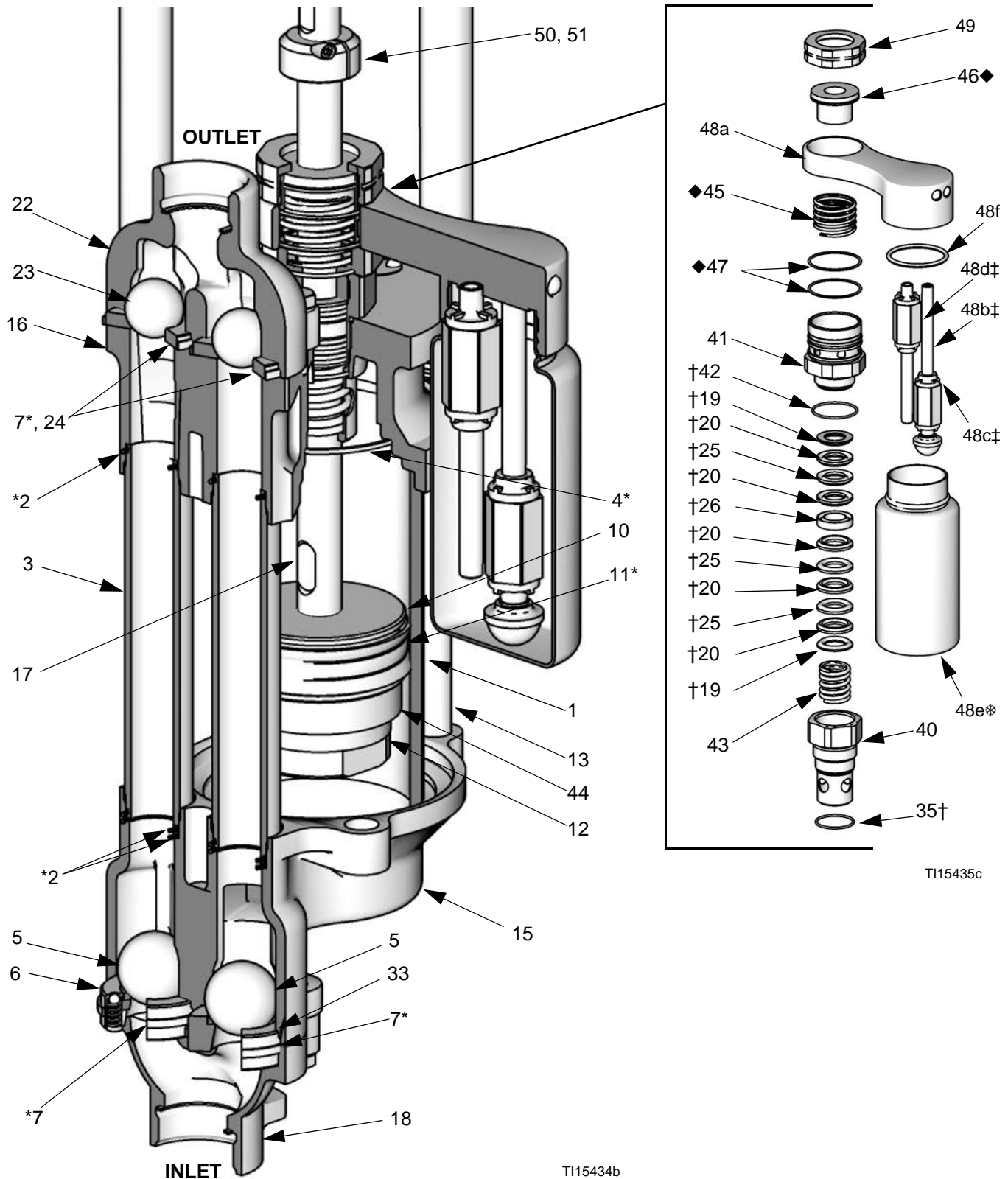


FIG. 5. Cutaway View of Lower

Lower Reassembly

1. See FIG. 4. Place the halves of the piston (10) around the packing (11) and snap them together.
2. Apply high strength (red) Loctite® 263 or 2760 to entire length of the piston rod (17) threads. Sealant must be allowed to cure for a minimum of 12 hours before use. Screw the rod through the piston and spacer (44) and into the piston nut (12). Torque the nut to 95-100 ft-lb (129-135 N•m).
3. With the inlet housing (15) turned upside down, install the balls (5) and the gaskets (7*).

COMPONENT RUPTURE HAZARD					
The relief valve seat (6) must be installed at the fluid inlet, as shown in FIG. 4 and FIG. 5. The relief valve reduces the risk of pump overpressurization. The seat cannot relieve pressure if installed on the other side of the inlet housing.					

4. Install the relief valve inlet seat (6) in the left side of the inlet housing (15), as viewed in FIG. 4 and FIG. 5. (Text cast into the inlet housing identifies the correct location for the relief valve seat.) The pin (P) on the seat must point into the housing. The pin limits the positioning of the seat, ensuring that the vent is not blocked by part of the housing. See FIG. 6.

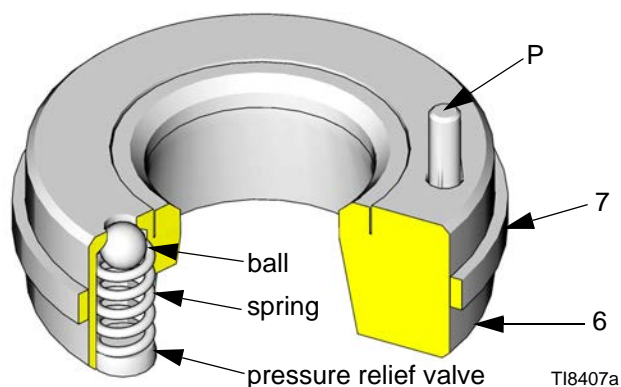


FIG. 6. Inlet Seat with Pressure Relief Valve

5. Install the inlet seat without a relief valve (33) in the right side of the inlet housing (15).

NOTE: The inlet seats (6 and 33) are not reversible; the chamfered side must face the ball.

6. Place the inlet manifold (18) on the inlet housing (15). Apply removable (blue) Loctite® 243 to entire length of the screw (9) threads. Install the lockwashers (8) and screws (9), and torque to 25-30 ft-lb (34-40 N•m).
7. Place the inlet manifold (18) in a vise. Place one o-ring (2*) in each side of the inlet housing (15), where the tubes (3) sit. Place o-rings (2*) in the grooves at each end of the tubes. Place a gasket (4) in both the inlet and outlet housing (15 and 16). Position the tubes and cylinder (1) in the inlet housing.

NOTE: It may be necessary to use a rubber mallet to set the fluid tubes (3) and cylinder (4) in place.

8. Lubricate the inside of the cylinder (4). Slide the piston assembly into the cylinder. Rotate the piston as shown in FIG. 7.

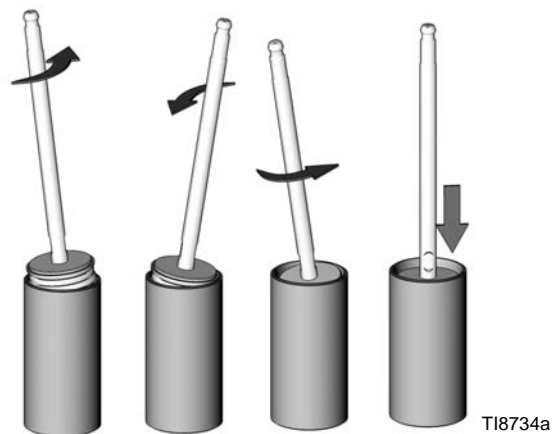


FIG. 7. Install Piston in Cylinder

9. Lubricate the throat packings and glands. Install the spring (43) and one male gland (19†) in the throat cartridge (40), then five v-packings with the lips facing down: one UHMWPE (20†), one leather (25†), UHMWPE, leather, UHMWPE. Install the female gland (26†). Install three v-packings with the lips facing up: UHMWPE, leather, UHMWPE. Install the other male gland (19†).
10. Lubricate the o-ring (42†) and install it on the wet-cup (41). Install the wet-cup finger-tight.
11. Install the o-ring (35†) on the throat cartridge (40). Apply lubricant to the throat cartridge threads then screw the cartridge into the outlet housing (16) loosely.
12. Install the outlet housing (16). It may not seat well on the tubes and cylinder. Install the screws (13) and lockwashers (14) from the inlet housing (15). As you tighten the screws into the outlet housing (16), they will draw the housings firmly onto the tubes and cylinders. Tighten the screws uniformly and torque to 25-30 ft-lb (34-40 N•m).
13. Torque the cartridge (40) to 95-100 ft-lb (129-135 N•m).
14. Torque the wet-cup (41) to 70-75 ft-lb (95-102 N•m).

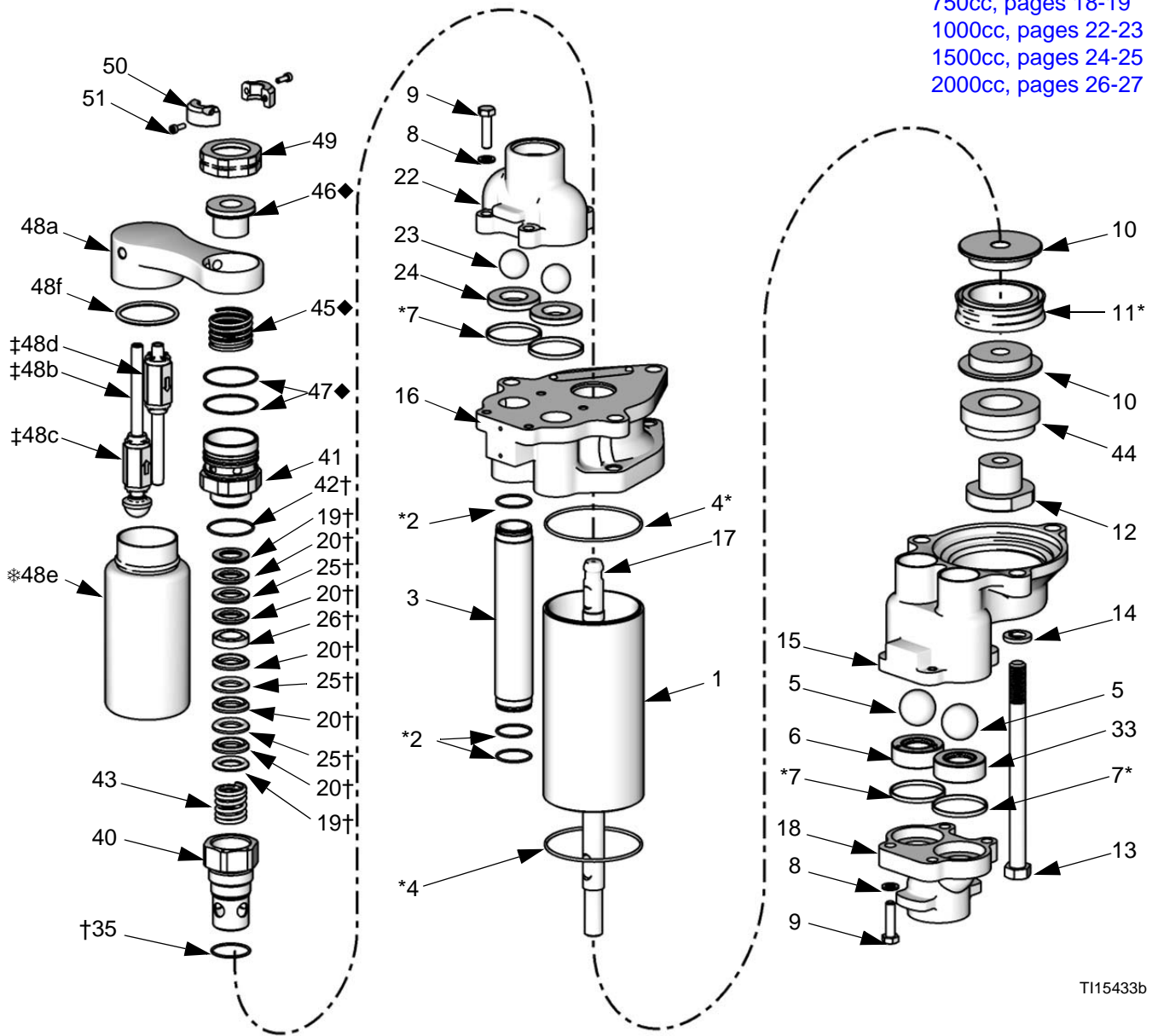
15. Place a ball (23), seat (24) and gasket (7*) in each side of the outlet manifold (22). Install the outlet manifold on the outlet housing (16).
16. Apply removable (blue) Loctite® 243 to entire length of the screw (9) threads. Install the lockwashers (8) and screws (9), and torque to 25-30 ft-lb (34-40 N•m).

NOTE: The outlet seats (24) are reversible.

17. Reassemble the spring (45), TSL pump piston seal (46), and o-rings (47).
18. Reassemble the manifold and bottle assembly (48), cap (49), collar (50) and screws (51). Torque the cap (49) to 25-30 ft-lb (34-40 N•m).
19. Reinstall the coupling nut and collars on the piston rod (17).
20. Fill the cavity in the bottom of the motor shaft with grease. Reconnect the lower to the motor as described in your separate pump manual.

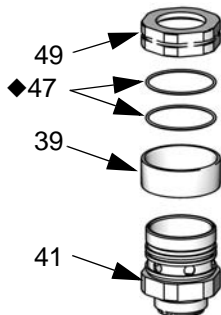
Parts

See Parts Lists:
 750cc, pages 18-19
 1000cc, pages 22-23
 1500cc, pages 24-25
 2000cc, pages 26-27



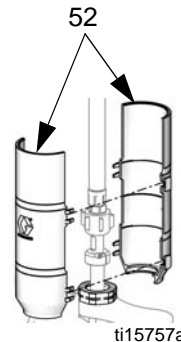
TI15433b

Open Wet-Cup (Drum Size only)



TI15611a

Shields (shipped loose)



ti15757a

750cc Lowers

Part No. 24F413, Series A, Stainless Steel

Part No. 24F414, Series A, Stainless Steel

Part No. 24F420, Series A, Carbon Steel

Part No. 24F415, Series A, Stainless Steel

Part No. 24F416, Series A, Stainless Steel

Part No. 24F417★, Series A, Stainless Steel

Part No. 24F418★, Series A, Stainless Steel

Part No. 24F421, Series A, Stainless Steel, Drum Size, with open wet-cup

Part No. 24F422, Series A, Stainless Steel, Drum Size, with open wet-cup

Part No. 24F423, Series A, Carbon Steel, Drum Size, with open wet-cup

Ref. No.	Description	Lower										Qty
		24F413	24F414	24F420	24F415	24F416	24F417★	24F418★	24F421	24F422	24F423	
1	CYLINDER, pump; sst/chrome	183049		183049	183049		183049		183049		183049	1
	CYLINDER, pump; sst/Ultra-Life		685971			685971		685971		685971		1
2*	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6
3	TUBE, fluid; sst	183085	183085	183085	183085	183085	183085	183085	183085	183085	183085	2
4*	GASKET, cylinder; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2
5	BALL, inlet; 1.25 in. dia; sst	101968	101968	101968	101968	101968	101968	101968	101968	101968	101968	2
6	SEAT, inlet valve, with relief valve; sst	253483	253483	253483	253483	253483	253483	253483	253483	253483	253483	1
7*	GASKET, seat, valve; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4
8	WASHER, flat; 8.4 mm; sst	111003	111003	111003	111003	111003	111003	111003	111003	111003	111003	8
9	CAPSCREW, socket hd; M8 x 1.25 x 25; sst	16K289	16K289	16K289	16K289	16K289	16K289	16K289	16K289	16K289	16K289	8
10	PISTON	16A249	16A249	16A249	16A249	16A249	16A249	16A249	16A249	16A249	16A249	2
11*	PACKING, piston; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
12	NUT, piston	108528	108528	108528	108528	108528	108528	108528	108528	108528	108528	1
13	CAPSCREW, hex hd; 9/16-12 unc x 7.5 in.; sst	120199	120199		120199	120199	120199	120199	120199	120199		3
	CAPSCREW, hex hd; 9/16-12 unc x 7.5 in.; cst			120446							120446	3
14	LOCKWASHER, spring; 9/16 in.; sst	108525	108525		108525	108525	108525	108525	108525	108525		3
	LOCKWASHER, spring; 9/16 in.; cst			101333							101333	3
15	HOUSING, inlet; cst			16D848							16D848	1
	HOUSING, inlet; sst	16E907	16E907		16E907	16E907	16E907	16E907	16E907	16E907		1
16	HOUSING, outlet; sst	16D847	16D847		16D847	16D847	16D847	16D847	16D847	16D847		1
	HOUSING, outlet; cst			16D849							16D849	1
17	ROD, piston; sst	16A462	16A462	16A462	16A462	16A462	16A462	16A462	16A462	16A462	16A462	1
18	MANIFOLD, inlet; npt; sst	192259	192259						192259	192259		1
	MANIFOLD, inlet; npt; cst			192260							192260	1
	MANIFOLD, inlet; tri-clamp; sst				15H663	15H663	15H663	15H663				1

Ref. No.	Description	Lower										Qty
		24F413	24F414	24F420	24F415	24F416	24F417★	24F418★	24F421	24F422	24F423	
19†	GLAND, male; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2
20†	V-PACKING, throat; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5
22	MANIFOLD, outlet; npt; sst	15G873	15G873						15G873	15G873		1
	MANIFOLD, outlet; npt; cst			181728							181728	1
	MANIFOLD, outlet; tri-clamp; sst				16E906	16E906	16E906	16E906				1
23	BALL, outlet; 1 in. (25 mm) dia.; sst	110259	110259	110259	110259	110259	110259	110259	110259	110259	110259	2
24**	SEAT, outlet valve; sst	183095	183095	183095	183095	183095	183095	183095	183095	183095	183095	2
25†	V-PACKING, throat; leather	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3
26†	GLAND, female; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
33	SEAT, inlet valve; sst	239865	239865	239865	236865	239865	239865	239865	239865	239865	239865	1
35†	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
36▲	TAG, warning; not shown	172479	172479	172479	172479	172479	172479	172479	172479	172479	172479	1
39	SPACER, open wet-cup								16E083	16E083	16E083	1
40	CARTRIDGE, throat	16A464	16A464	16A464	16A464	16A464	16A464	16A464	16A464	16A464	16A464	1
41	WET CUP	16A463	16A463	16A463	16A463	16A463	16A463	16A463	16A463	16A463	16A463	1
42†	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
43	SPRING	16A547	16A547	16A547	16A547	16A547	16A547	16A547	16A547	16A547	16A547	1
45◆	SPRING	n/a	n/a	n/a	n/a	n/a	n/a	n/a				1
46◆	SEAL, piston, TSL pump	n/a	n/a	n/a	n/a	n/a	n/a	n/a				1
47◆	O-RING	108657	108657	108657	108657	108657	108657	108657	108657	108657	108657	2
48	MANIFOLD/BOTTLE; includes 48a-48f	24T074	24T074	24T074	24T074	24T074	24T074	24T074				1
48a	MANIFOLD; nylon	n/a	n/a	n/a	n/a	n/a	n/a	n/a				1
48b‡	NIPPLE; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a				1
48c‡	INLET CHECK; nylon, sst, fluoroelastomer	n/a	n/a	n/a	n/a	n/a	n/a	n/a				1
48d‡	OUTLET CHECK; nylon, sst, pvc, fluoroelastomer	n/a	n/a	n/a	n/a	n/a	n/a	n/a				1
48e*	BOTTLE; hdpe	n/a	n/a	n/a	n/a	n/a	n/a	n/a				1
48f	O-RING	16G290	16G290	16G290	16G290	16G290	16G290	16G290				1
49	CAP, wet-cup	16F050	16F050	16F050	16F050	16F050	16F050	16F050	16F050	16F050	16F050	1
50	COLLAR, piston rod	16E414	16E414	16E414	16E414	16E414	16E414	16E414				2
51	SCREW; M4 x 12	115263	115263	115263	115263	115263	115263	115263				2
52	SHIELD KITS; some lowers include shield kits in multiple sizes; see manual 406876 to select the correct size kit for your lower and motor	24A640	24A640	24A640	24A640	24A640						1
		24F252	24F252	24F252	24F252	24F252						
							24F253	24F253				

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- ★ These models are for use with Graco E-Flo Pumps only.
- ▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.
- * Parts included in Seal Repair Kit 16E904 (purchase separately).
- † Parts included in Throat Packing Repair Kit 24F245 (purchase separately).
- ** Carbide Seat Kit 24F249 is available for applications causing excessive wear (purchase separately).

- ◆ Parts included in TSL Pump Repair Kit 24F617 (purchase separately).
 - * Order TSL Bottle Replacement Kit 24F405 (purchase separately). Includes 5 bottles.
 - ‡ Parts included in TSL Check Valve Repair Kit 24F404 (purchase separately).
- Complete Pump Repair Kit 24F660 is available (purchase separately).
- Parts labeled n/a are not available separately.

Part No. 24F446★, Series A, Stainless Steel (see 406865 for details)[Click here to return to repair kit page.](#)

Ref. No.	Description	Lower	Qty
		24F446★	
1	CYLINDER, pump; sst/chrome	183049	1
2*	PACKING, o-ring; PTFE	n/a	6
3	TUBE, fluid; sst	183085	2
4*	GASKET, cylinder; UHMWPE	n/a	2
5	BALL, inlet; 1.25 in. dia; sst	101968	2
6	SEAT, inlet valve, with relief valve; sst	253483	1
7*(**)	GASKET, seat, valve; UHMWPE	n/a	4
8	WASHER, flat; 8.4 mm; sst	111003	8
9	CAPSCREW, socket hd; M8 x 1.25 x 25; sst	16K289	8
10	PISTON	16A249	2
11*	PACKING, piston; UHMWPE	n/a	1
12	NUT, piston	108528	1
13	CAPSCREW, hex hd; 9/16-12 unc x 7.5 in.; sst	120199	3
14	LOCKWASHER, spring; 9/16 in.; sst	108525	3
15	HOUSING, inlet; sst	16E907	1
16	HOUSING, outlet; sst	16D847	1
17	ROD, piston; sst	16A462	1
18	MANIFOLD, inlet; tri-clamp; sst	15H663	1
19†	GLAND, male; sst	n/a	2
20†	V-PACKING, throat; UHMWPE	n/a	5
22	MANIFOLD, outlet; tri-clamp; sst	16E906	1
23(**)	BALL, outlet; 1 in. (25 mm) dia.; sst	110259	2
24(**)	SEAT, outlet valve; sst	183095	2
25†	V-PACKING, throat; leather	n/a	3
26†	GLAND, female; sst	n/a	1
33	SEAT, inlet valve; sst	239865	1
35†	PACKING, o-ring; PTFE	n/a	1
36▲	TAG, warning; not shown	172479	1
40	CARTRIDGE, throat	16E926	1
41	WET CUP	181684	1

★ These models are for use with Graco E-Flo Pumps only.

▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

* Parts included in Seal Repair Kit 16E904 (purchase separately).

† Parts included in Throat Packing Repair Kit 24F245 (purchase separately).

** Carbide Seat Kit 24F249 is available for applications causing excessive wear (purchase separately).

Complete Pump Repair Kit 24F660 is available (purchase separately).

Parts labeled n/a are not available separately.

1000cc Lowers**Part No. 24F424, Series A, Stainless Steel****Part No. 24F425, Series A, Stainless Steel****Part No. 24F431, Series A, Carbon Steel****Part No. 24F426, Series A, Stainless Steel****Part No. 24F427, Series A, Stainless Steel****Part No. 24F428★, Series A, Stainless Steel****Part No. 24F429★, Series A, Stainless Steel**

Ref. No.	Description	Lower							Qty
		24F424	24F425	24F431	24F426	24F427	24F428★	24F429★	
1	CYLINDER, pump; sst/chrome	183047		183047	183047		183047		1
	CYLINDER, pump; sst/Ultra-Life		17G628			17G628		17G628	1
2*	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6
3	TUBE, fluid; sst	183085	183085	183085	183085	183085	183085	183085	2
4*	GASKET, cylinder; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2
5	BALL, inlet; 1.25 in. dia; sst	101968	101968	101968	101968	101968	101968	101968	2
6	SEAT, inlet valve, with relief valve; sst	253483	253483	253483	253483	253483	253483	253483	1
7*	GASKET, seat, valve; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4
8	WASHER, flat; 8.4 mm; sst	111003	111003	111003	111003	111003	111003	111003	8
9	CAPSCREW, socket hd; M8 x 1.25 x 25; sst	16K289	16K289	16K289	16K289	16K289	16K289	16K289	8
10	PISTON	15G883	15G883	15G883	15G883	15G883	15G883	15G883	2
11*	PACKING, piston; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
12	NUT, piston	15H989	15H989	15H989	15H989	15H989	15H989	15H989	1
13	CAPSCREW, hex hd; 9/16-12 unc x 7.5 in.; sst	120199	120199		120199	120199	120199	120199	3
	CAPSCREW, hex hd; 9/16-12 unc x 7.5 in.; cst			120446					3
14	LOCKWASHER, spring; 9/16 in.; sst	108525	108525		108525	108525	108525	108525	3
	LOCKWASHER, spring; 9/16 in.; cst			101333					3
15	HOUSING, inlet; cst			16D848					1
	HOUSING, inlet; sst	16E907	16E907		16E907	16E907	16E907	16E907	1
16	HOUSING, outlet; sst	16D847	16D847		16D847	16D847	16D847	16D847	1
	HOUSING, outlet; cst			16D849					1
17	ROD, piston; sst	16A462	16A462	16A462	16A462	16A462	16A462	16A462	1
18	MANIFOLD, inlet; npt; sst	192259	192259						1
	MANIFOLD, inlet; npt; cst			192260					1
	MANIFOLD, inlet; tri-clamp; sst				15H663	15H663	15H663	15H663	1
19†	GLAND, male; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2
20†	V-PACKING, throat; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5

Ref. No.	Description	Lower							Qty
		24F424	24F425	24F431	24F426	24F427	24F428★	24F429★	
22	MANIFOLD, outlet; npt; sst	15G873	15G873						1
	MANIFOLD, outlet; npt; cst			181728					1
	MANIFOLD, outlet; tri-clamp; sst				16E906	16E906	16E906	16E906	1
23	BALL, outlet; 1 in. (25 mm) dia.; sst	110259	110259	110259	110259	110259	110259	110259	2
24**	SEAT, outlet valve; sst	183095	183095	183095	183095	183095	183095	183095	2
25†	V-PACKING, throat; leather	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3
26†	GLAND, female; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
33	SEAT, inlet valve; sst	239865	239865	239865	236865	239865	239865	239865	1
35†	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
36▲	TAG, warning (not shown)	172479	172479	172479	172479	172479	172479	172479	1
40	CARTRIDGE, packing, throat	16A464	16A464	16A464	16A464	16A464	16A464	16A464	1
41	WET CUP	16A463	16A463	16A463	16A463	16A463	16A463	16A463	1
42†	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
43	SPRING	16A547	16A547	16A547	16A547	16A547	16A547	16A547	1
44	SPACER, piston	16D850	16D850	16D850	16D850	16D850	16D850	16D850	1
45◆	SPRING	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
46◆	SEAL, piston, TSL pump	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
47◆	O-RING	108657	108657	108657	108657	108657	108657	108657	2
48	MANIFOLD/BOTTLE; includes 48a-48f	24T074	24T074	24T074	24T074	24T074	24T074	24T074	1
48a	MANIFOLD; nylon	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48b‡	NIPPLE; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48c‡	INLET CHECK; nylon, sst, fluoroelastomer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48d‡	OUTLET CHECK; nylon, sst, pvc, fluoroelastomer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48e*	BOTTLE; hdpe	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48f	O-RING	16G290	16G290	16G290	16G290	16G290	16G290	16G290	1
49	CAP, wet-cup	16F050	16F050	16F050	16F050	16F050	16F050	16F050	1
50	COLLAR, piston rod	16E414	16E414	16E414	16E414	16E414	16E414	16E414	2
51	SCREW; M4 x 12	115263	115263	115263	115263	115263	115263	115263	2
52	SHIELD KITS; some lowers include shield kits in multiple sizes; see manual 406876 to select the correct size kit for your lower and motor	24A640	24A640	24A640	24A640	24A640			1
		24F251	24F251	24F251	24F251	24F251			
		24F252	24F252	24F252	24F252	24F252			
							24F253	24F253	

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★ These models are for use with Graco E-Flo Pumps only.

▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

* Parts included in Seal Repair Kit 277360 (purchase separately).

† Parts included in Throat Packing Repair Kit 24F245 (purchase separately).

** Carbide Seat Kit 24F249 is available for applications causing excessive wear (purchase separately).

◆ Parts included in TSL Pump Repair Kit 24F617 (purchase separately).

* Order TSL Bottle Replacement Kit 24F405 (purchase separately). Includes 5 bottles.

‡ Parts included in TSL Check Valve Repair Kit 24F404 (purchase separately).

Complete Pump Repair Kit 24F661 is available (purchase separately).

Parts labeled n/a are not available separately.

1500cc Lowers**Part No. 24F432, Series A, Stainless Steel****Part No. 24F433, Series A, Stainless Steel****Part No. 24F439, Series A, Carbon Steel****Part No. 24F434, Series A, Stainless Steel****Part No. 24F435, Series A, Stainless Steel****Part No. 24F436★, Series A, Stainless Steel****Part No. 24F437★, Series A, Stainless Steel**

Ref. No.	Description	Lower							Qty
		24F432	24F433	24F439	24F434	24F435	24F436★	24F437★	
1	CYLINDER, pump; sst/chrome	183048		183048	183048		183048		1
	CYLINDER, pump; sst/Ultra-Life		17G629			17G629		17G629	1
2*	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6
3	TUBE, fluid; sst	183085	183085	183085	183085	183085	183085	183085	2
4*	GASKET, cylinder; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2
5	BALL, inlet; 1.25 in. dia; sst	101968	101968	101968	101968	101968	101968	101968	2
6	SEAT, inlet valve, with relief valve; sst	253483	253483	253483	253483	253483	253483	253483	1
7*	GASKET, seat, valve; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4
8	WASHER, flat; 8.4 mm; sst	111003	111003	111003	111003	111003	111003	111003	8
9	CAPSCREW, socket hd; M8 x 1.25 x 25; sst	16K289	16K289	16K289	16K289	16K289	16K289	16K289	8
10	PISTON	15G884	15G884	15G884	15G884	15G884	15G884	15G884	2
11*	PACKING, piston; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
12	NUT, piston	15H989	15H989	15H989	15H989	15H989	15H989	15H989	1
13	CAPSCREW, hex hd; 9/16-12 unc x 7.5 in.; sst	120199	120199		120199	120199	120199	120199	3
	CAPSCREW, hex hd; 9/16-12 unc x 7.5 in.; cst			120446					3
14	LOCKWASHER, spring; 9/16 in.; sst	108525	108525		108525	108525	108525	108525	3
	LOCKWASHER, spring; 9/16 in.; cst			101333					3
15	HOUSING, inlet; cst			16D848					1
	HOUSING, inlet; sst	16E907	16E907		16E907	16E907	16E907	16E907	1
16	HOUSING, outlet; sst	16D847	16D847		16D847	16D847	16D847	16D847	1
	HOUSING, outlet; cst			16D849					1
17	ROD, piston; sst	16A462	16A462	16A462	16A462	16A462	16A462	16A462	1
18	MANIFOLD, inlet; npt; sst	192259	192259						1
	MANIFOLD, inlet; npt; cst			192260					1
	MANIFOLD, inlet; tri-clamp; sst				15H663	15H663	15H663	15H663	1
19†	GLAND, male; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2
20†	V-PACKING, throat; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5

Ref. No.	Description	Lower							Qty
		24F432	24F433	24F439	24F434	24F435	24F436★	24F437★	
22	MANIFOLD, outlet; npt; sst	15G873	15G873						1
	MANIFOLD, outlet; npt; cst			181728					1
	MANIFOLD, outlet; tri-clamp; sst				16E906	16E906	16E906	16E906	1
23	BALL, outlet; 1 in. (25 mm) dia.; sst	110259	110259	110259	110259	110259	110259	110259	2
24**	SEAT, outlet valve; sst	183095	183095	183095	183095	183095	183095	183095	2
25†	V-PACKING, throat; leather	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3
26†	GLAND, female; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
33	SEAT, inlet valve; sst	239865	239865	239865	236865	239865	239865	239865	1
35†	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
36▲	TAG, warning (not shown)	172479	172479	172479	172479	172479	172479	172479	1
40	CARTRIDGE, packing, throat	16A464	16A464	16A464	16A464	16A464	16A464	16A464	1
41	WET CUP	16A463	16A463	16A463	16A463	16A463	16A463	16A463	1
42†	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
43	SPRING	16A547	16A547	16A547	16A547	16A547	16A547	16A547	1
44	SPACER, piston	16D851	16D851	16D851	16D851	16D851	16D851	16D851	1
45◆	SPRING	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
46◆	SEAL, piston, TSL pump	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
47◆	O-RING	108657	108657	108657	108657	108657	108657	108657	2
48	MANIFOLD/BOTTLE; includes 48a-48f	24T074	24T074	24T074	24T074	24T074	24T074	24T074	1
48a	MANIFOLD; nylon	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48b‡	NIPPLE; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48c‡	INLET CHECK; nylon, sst, fluoroelastomer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48d‡	OUTLET CHECK; nylon, sst, pvc, fluoroelastomer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48e*	BOTTLE; hdpe	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48f	O-RING	16G290	16G290	16G290	16G290	16G290	16G290	16G290	1
49	CAP, wet-cup	16F050	16F050	16F050	16F050	16F050	16F050	16F050	1
50	COLLAR, piston rod	16E414	16E414	16E414	16E414	16E414	16E414	16E414	2
51	SCREW; M4 x 12	115263	115263	115263	115263	115263	115263	115263	2
52	SHIELD KITS; some lowers include shield kits in multiple sizes; see manual 406876 to select the correct size kit for your lower and motor	24A640	24A640	24A640	24A640	24A640			1
		24F251	24F251	24F251	24F251	24F251			
		24F252	24F252	24F252	24F252	24F252			
							24F253	24F253	

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▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

* Parts included in Seal Repair Kit 277362 (purchase separately).

† Parts included in Throat Packing Repair Kit 24F245 (purchase separately).

** Carbide Seat Kit 24F249 is available for applications causing excessive wear (purchase separately).

◆ Parts included in TSL Pump Repair Kit 24F617 (purchase separately).

* Order TSL Bottle Replacement Kit 24F405 (purchase separately). Includes 5 bottles.

‡ Parts included in TSL Check Valve Repair Kit 24F404 (purchase separately).

Complete Pump Repair Kit 24F662 is available (purchase separately).

Parts labeled n/a are not available separately.

2000cc Lowers

Part No. 24F440, Series A, Stainless Steel

Part No. 24F447, Series A, Carbon Steel

Part No. 24F441, Series A, Stainless Steel

Part No. 24F442, Series A, Stainless Steel

Part No. 24F443, Series A, Stainless Steel

Part No. 24F444★, Series A, Stainless Steel

Part No. 24F445★, Series A, Stainless Steel

Ref. No.	Description	Lower							Qty
		24F440	24F447	24F441	24F442	24F443	24F444★	24F445★	
1	CYLINDER, pump; sst/chrome	15G882	15G882	15G882			15G882		1
	CYLINDER, pump; sst/Ultra-Life				17G630	17G630		17G630	1
2*	PACKING, o-ring; PTFE	108526	108526	108526	108526	108526	108526	108526	6
3	TUBE, fluid; sst	183085	183085	183085	183085	183085	183085	183085	2
4*	GASKET, cylinder; UHMWPE	15G881	15G881	15G881	15G881	15G881	15G881	15G881	2
5	BALL, inlet; 1.25 in. dia; sst	101968	101968	101968	101968	101968	101968	101968	2
6	SEAT, inlet valve, with relief valve; sst	253483	253483	253483	253483	253483	253483	253483	1
7*	GASKET, seat, valve; UHMWPE	181877	181877	181877	181877	181877	181877	181877	4
8	WASHER, flat; 8.4 mm; sst	111003	111003	111003	111003	111003	111003	111003	8
9	CAPSCREW, socket hd; M8 x 1.25 x 25; sst	16K289	16K289	16K289	16K289	16K289	16K289	16K289	8
10	PISTON	15G885	15G885	15G885	15G885	15G885	15G885	15G885	2
11*	PACKING, piston; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
12	NUT, piston	15H989	15H989	15H989	15H989	15H989	15H989	15H989	1
13	CAPSCREW, hex hd; 9/16-12 unc x 7.5 in.; sst	120199		120199	120199	120199	120199	120199	3
	CAPSCREW, hex hd; 9/16-12 unc x 7.5 in.; cst		120446						3
14	LOCKWASHER, spring; 9/16 in.; sst	108525		108525	108525	108525	108525	108525	3
	LOCKWASHER, spring; 9/16 in.; cst		101333						3
15	HOUSING, inlet; cst		16D848						1
	HOUSING, inlet; sst	16E907		16E907	16E907	16E907	16E907	16E907	1
16	HOUSING, outlet; sst	16D847		16D847	16D847	16D847	16D847	16D847	1
	HOUSING, outlet; cst		16D849						1
17	ROD, piston; sst	16A462	16A462	16A462	16A462	16A462	16A462	16A462	1
18	MANIFOLD, inlet; npt; sst	192259				192259			1
	MANIFOLD, inlet; npt; cst		192260						1
	MANIFOLD, inlet; tri-clamp; sst			15H663	15H663		15H663	15H663	1
19†	GLAND, male; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2
20†	V-PACKING, throat; UHMWPE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5

Ref. No.	Description	Lower							Qty
		24F440	24F447	24F441	24F442	24F443	24F444★	24F445★	
22	MANIFOLD, outlet; npt; sst	15G873				15G873			1
	MANIFOLD, outlet; npt; cst		181728						1
	MANIFOLD, outlet; tri-clamp; sst			16E906	16E906		16E906	16E906	1
23	BALL, outlet; 1 in. (25 mm) dia.; sst	110259	110259	110259	110259	110259	110259	110259	2
24**	SEAT, outlet valve; sst	183095	183095	183095	183095	183095	183095	183095	2
25†	V-PACKING, throat; leather	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3
26†	GLAND, female; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
33	SEAT, inlet valve; sst	239865	239865	239865	236865	239865	239865	239865	1
35†	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
36▲	TAG, warning (not shown)	172479	172479	172479	172479	172479	172479	172479	1
40	CARTRIDGE, packing, throat	16A464	16A464	16A464	16A464	16A464	16A464	16A464	1
41	WET CUP	16A463	16A463	16A463	16A463	16A463	16A463	16A463	1
42†	PACKING, o-ring; PTFE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
43	SPRING	16A547	16A547	16A547	16A547	16A547	16A547	16A547	1
44	SPACER, piston	16D852	16D852	16D852	16D852	16D852	16D852	16D852	1
45◆	SPRING	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
46◆	SEAL, piston, TSL pump	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
47◆	O-RING	108657	108657	108657	108657	108657	108657	108657	2
48	MANIFOLD/BOTTLE; includes 48a-48f	24T074	24T074	24T074	24T074	24T074	24T074	24T074	1
48a	MANIFOLD; nylon	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48b‡	NIPPLE; sst	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48c‡	INLET CHECK; nylon, sst, fluoroelastomer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48d‡	OUTLET CHECK; nylon, sst, pvc, fluoroelastomer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48e*	BOTTLE; hdpe	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
48f	O-RING	16G290	16G290	16G290	16G290	16G290	16G290	16G290	1
49	CAP, wet-cup	16F050	16F050	16F050	16F050	16F050	16F050	16F050	1
50	COLLAR, piston rod	16E414	16E414	16E414	16E414	16E414	16E414	16E414	2
51	SCREW; M4 x 12	115263	115263	115263	115263	115263	115263	115263	2
52	SHIELD KITS; some lowers include shield kits in multiple sizes; see manual 406876 to select the correct size kit for your lower and motor	24A640	24A640	24A640	24A640	24A640			1
		24F251	24F251	24F251	24F251	24F251			
		24F252	24F252	24F252	24F252	24F252			
							24F253	24F253	

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★ These models are for use with Graco E-Flo Pumps only.

▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

* Parts included in Seal Repair Kit 277358 (purchase separately).

† Parts included in Throat Packing Repair Kit 24F245 (purchase separately).

** Carbide Seat Kit 24F249 is available for applications causing excessive wear (purchase separately).

◆ Parts included in TSL Pump Repair Kit 24F617 (purchase separately).

* Order TSL Bottle Replacement Kit 24F405 (purchase separately). Includes 5 bottles.

‡ Parts included in TSL Check Valve Repair Kit 24F404 (purchase separately).

Complete Pump Repair Kit 24F663 is available (purchase separately).

Parts labeled n/a are not available separately.

Repair Kits, Related Manuals, and Accessories

NOTE: The lowers listed in this manual **must** use the throat packing kits and the complete pump repair kits listed in the following table. **Do not** use kits for older-style lowers (see manual 311690) with these lowers. The throat packing gland height has changed.

NOTE: For best results, install the TSL Pump Repair Kit 24F617 each time the throat packings are changed.

Part No.	Description	Related Manuals	Manual Description	Repair Kits	Repair Kit Description
All lowers in this manual.	750 cc, 1000 cc, 1500 cc, 2000 cc Low-ers	3A0539	4-Ball Lower Instructions-Parts	24F245	Standard Throat Packing Kit, 3 Leather and 5 UHMWPE Packings. Includes items 19, 20, 25, 26, 35, 42.
				24F244	Throat Packing Conversion Kit, 8 Leather Packings. Includes items 19, 20, 26, 35, 42.
				24F243	Throat Packing Conversion Kit, 8 PTFE Packings. Includes items 19, 20, 26, 35, 42.
				24F246	Throat Packing Conversion Kit, 3 PTFE and 5 UHMWPE Packings. Includes items 19, 20, 25, 26, 35, 42.
				24F617	TSL Pump Repair Kit. Includes items 45, 46, and 47. For best results, install each time the throat packings are changed.
				24F404	TSL Check Valve Repair Kit. Includes items 48b, 48c, 48d.
				24F405	TSL Bottle Replacement Kit. Includes five of item 48e.
				24F249	Carbide Seat Kit. For applications causing excessive wear to the standard stainless steel outlet seats. Includes items 7, 23, 24 (carbide).
24F413	750 cc Lower	3A0539	4-Ball Lower Instructions-Parts	16E904	Piston Seal Repair Kit. Includes items 2, 4, 7, 11 (UHMWPE).
24F414				16E895	Piston Seal Conversion Kit. Includes items 2, 4, 7, 11 (PTFE).
24F415				24F660	Complete Pump Repair Kit. Includes items 2, 4, 7, 11, 19, 20, 25, 26, 35, 42, 45, 46, 47.
24F416					
24F417					
24F418					
24F420					
24F421					
24F422					
24F423					
24F446					

Part No.	Description	Related Manuals	Manual Description	Repair Kits	Repair Kit Description
24F424 24F425 24F426 24F427 24F428 24F429 24F431	1000 cc Lower	3A0539	4-Ball Lower Instructions-Parts	277360	Piston Seal Repair Kit. Includes items 2, 4, 7, 11 (UHMWPE).
				277361	Piston Seal Conversion Kit. Includes items 2, 4, 7, 11 (PTFE).
				24F661	Complete Pump Repair Kit. Includes items 2, 4, 7, 11, 19, 20, 25, 26, 35, 42, 45, 46, 47.
24F432 24F433 24F434 24F435 24F436 24F437 24F439	1500 cc Lower	3A0539	4-Ball Lower Instructions-Parts	277362	Piston Seal Repair Kit. Includes items 2, 4, 7, 11 (UHMWPE).
				277363	Piston Seal Conversion Kit. Includes items 2, 4, 7, 11 (PTFE).
				24F662	Complete Pump Repair Kit. Includes items 2, 4, 7, 11, 19, 20, 25, 26, 35, 42, 45, 46, 47.
24F440 24F441 24F442 24F443 24F444 24F445 24F447	2000 cc Lower	3A0539	4-Ball Lower Instructions-Parts	277358	Piston Seal Repair Kit. Includes items 2, 4, 7, 11 (UHMWPE).
				277359	Piston Seal Conversion Kit. Includes items 2, 4, 7, 11 (PTFE).
				24F663	Complete Pump Repair Kit. Includes items 2, 4, 7, 11, 19, 20, 25, 26, 35, 42, 45, 46, 47.

[illegible]

Technical Data

4-Ball Pump Lowers (750, 1000, 1500, and 2000 cc Sizes)		
	U.S.	Metric
Maximum Fluid Working Pressure	460 psi	3.2 MPa, 32 bar
Displacement per Cycle (4.75 in. [12 cm] stroke)		
750 cc Lowers	750 cc	
1000 cc Lowers	1000 cc	
1500 cc Lowers	1500 cc	
2000 cc Lowers	2000 cc	
Maximum Fluid Temperature Rating	150°F	66°C
Fluid Inlet and Outlet Sizes	See Models , pages 2-3.	
Weight		
750 cc Lowers	41 lb	18.6 kg
1000 cc Lowers	42 lb	19.0 kg
1500 cc Lowers	43 lb	19.5 kg
2000 cc Lowers	44 lb	20.0 kg
Wetted Parts (main pump)	Stainless Steel, PTFE, Leather, Ultra-High Molecular Weight Polyethylene, Tungsten Carbide, Acetal, Carbon Steel (<i>Models 24F420, 24F431, 24F439, 24F447, and 24F423 only</i>)	
Wetted Parts (enclosed wet-cup)	Stainless Steel, Ultra-High Molecular Weight Polyethylene, High-density Polyethylene, Nylon, Fluoroelastomer	

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Graco Standard Warranty

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

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Original instructions. This manual contains English. MM 3A0539

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Revision M, September 2016