

# APD20 Advanced Precision Driver

3A6482E

EN

*Electric driver for the supply and application of sealant and adhesive materials. For professional use only.*

**Not approved for use in explosive atmospheres or hazardous locations.**

## Model 25N519

Vertical driver for E-Flo<sup>®</sup> SP Electric Supply Pumps

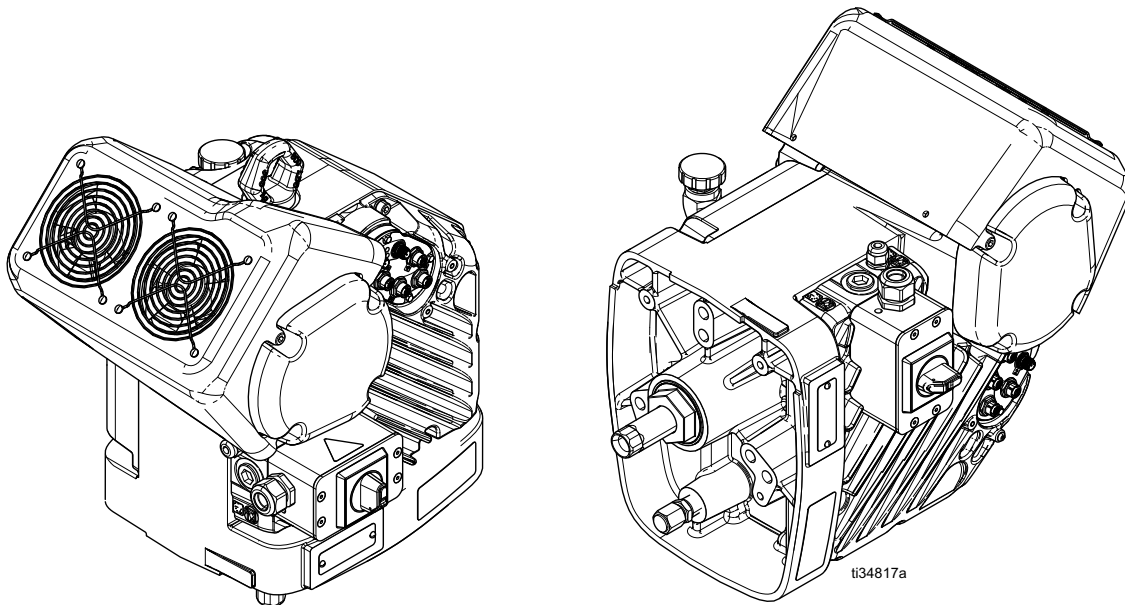
## Model 25N520

Horizontal driver for EFR Electric Fixed Ratio Proportioner



### Important Safety Instructions

Read all warnings and instructions in this manual and all related manuals before using the equipment. Save all instructions.



# Contents

<b>Related Manuals</b> .....	<b>2</b>	<b>Repair</b> .....	<b>11</b>
<b>Warnings</b> .....	<b>3</b>	Replace Fan Assembly .....	11
<b>Component Identification</b> .....	<b>5</b>	Replace Electronics Cover .....	12
<b>Installation</b> .....	<b>6</b>	Calibrate the Electric Driver .....	15
Power Requirements .....	6	Replace Gear and Output Shaft .....	15
Connect Power .....	6	Replace the Motor Rotor and Encoder .....	19
Grounding .....	7	Update Software .....	22
Install Vented Oil Cap Before Using Equipment .	8	<b>Parts</b> .....	<b>24</b>
<b>Pressure Relief Procedure</b> .....	<b>8</b>	Vertical Electric Driver (25N519) .....	24
<b>Operation</b> .....	<b>8</b>	Horizontal Electric Driver (25N520) .....	24
<b>Maintenance</b> .....	<b>9</b>	Electrical Enclosure .....	26
Preventive Maintenance Schedule .....	9	Gear Box .....	27
Check the Oil Level .....	9	<b>Repair Kits and Accessories</b> .....	<b>30</b>
Change the Oil .....	10	<b>Wiring Diagram</b> .....	<b>31</b>
Bearing Pre-Load .....	10	<b>Mounting Hole Pattern</b> .....	<b>33</b>
		<b>Dimensions</b> .....	<b>34</b>
		<b>Technical Specifications</b> .....	<b>35</b>
		<b>California Proposition 65</b> .....	<b>35</b>
		<b>Graco Standard Warranty</b> .....	<b>36</b>








## Related Manuals

Manuals are available at [www.graco.com](http://www.graco.com).

Manual in English	Description
3A6165	EFR Electric Fixed Ratio Proportioner
3A6586	E-Flo <sup>®</sup> SP Electric Pump
3A6331	E-Flo <sup>®</sup> SP Supply Systems
3A6724	E-Flo <sup>®</sup> SP Software
3B0397	E-Flo <sup>®</sup> Motors Encoder Replacement Kits

# 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 or on warning labels, 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.

 <h2 style="margin: 0;">WARNING</h2>	
 	<p><b>ELECTRIC SHOCK HAZARD</b></p> <p>This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.</p> <ul style="list-style-type: none"> <li>• Turn off and disconnect power at main switch before disconnecting any cables and before servicing or installing equipment.</li> <li>• Connect only to grounded power source.</li> <li>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>
   	<p><b>FIRE AND EXPLOSION HAZARD</b></p> <p>Flammable fumes, such as solvent and paint fumes, in <b>work area</b> can ignite or explode. Paint or solvent flowing through the equipment can cause static sparking. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> <li>• Use equipment only in well-ventilated area.</li> <li>• Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static sparking).</li> <li>• Ground all equipment in the work area. See <b>Grounding</b> instructions.</li> <li>• Never spray or flush solvent at high pressure.</li> <li>• Keep work area free of debris, including solvent, rags and gasoline.</li> <li>• Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.</li> <li>• Use only grounded hoses.</li> <li>• Hold gun firmly to side of grounded pail when triggering into pail. Do not use pail liners unless they are anti-static or conductive.</li> <li>• <b>Stop operation immediately</b> if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem.</li> <li>• Keep a working fire extinguisher in the work area.</li> </ul>

# **WARNING**



## **EQUIPMENT MISUSE HAZARD**

Misuse can cause death or serious injury.



- 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 Specifications** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Specifications** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheets (SDSs) 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. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- 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.



## **MOVING PARTS HAZARD**

Moving parts can pinch, cut or amputate fingers and other body parts.



- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Equipment can start without warning. Before checking, moving, or servicing equipment, follow the **Pressure Relief Procedure** and disconnect all power sources.

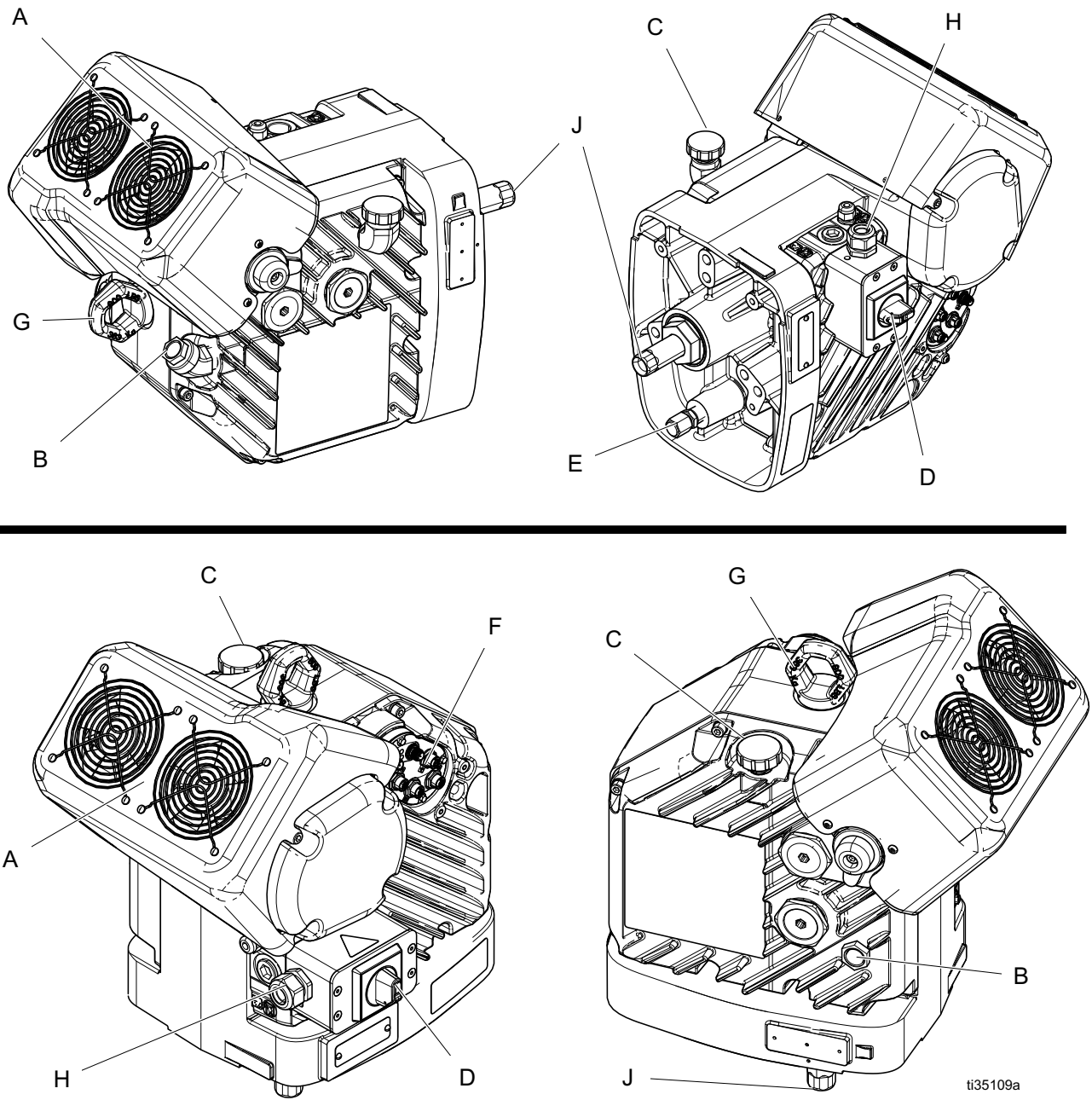


## **PERSONAL PROTECTIVE EQUIPMENT**

Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. Protective equipment includes but is not limited to:

- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

# Component Identification





**FIG. 1: Horizontal Driver (Top) and Vertical Driver (Bottom)**

Ref.	Description
A	Cooling Fan Assembly
B	Gearbox Oil Sight Glass
C	Gearbox Oil Breather Plug
D	Power Disconnect Switch
E	Gearbox Oil Drain Plug

Ref.	Description
F	Communication Ports
G	Lift Ring
H	Incoming Power Connections
J	Output Shaft

# Installation

				
All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.				

## Power Requirements

The system requires a dedicated circuit protected with a circuit breaker.

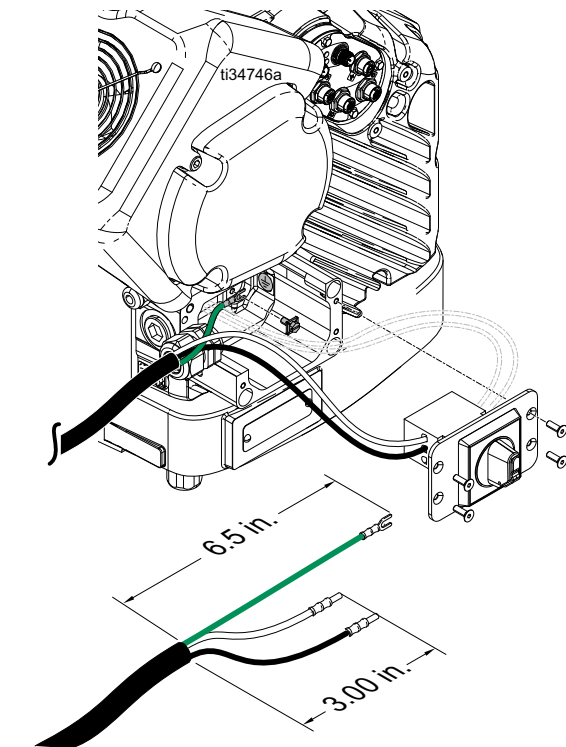
Voltage	Phase	Hz	Current
200-240 VAC	1	50/60	20 A

## Connect Power

1. Cut the power cord wires to the following lengths:

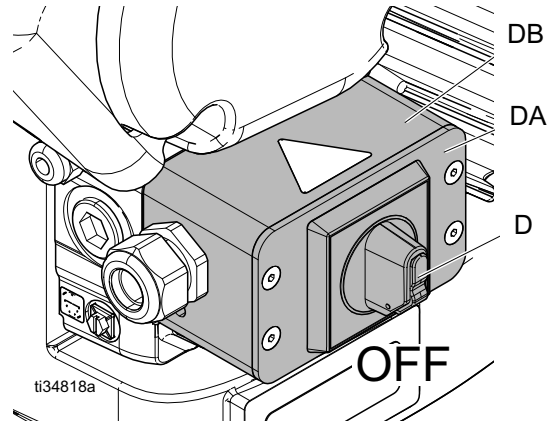
- Ground wire - 6.5 in. (16.5 cm)
- Power wires - 3.0 in. (7.6 cm)
- Add ferrules as necessary

**NOTE:** The power cord is not supplied with the driver.



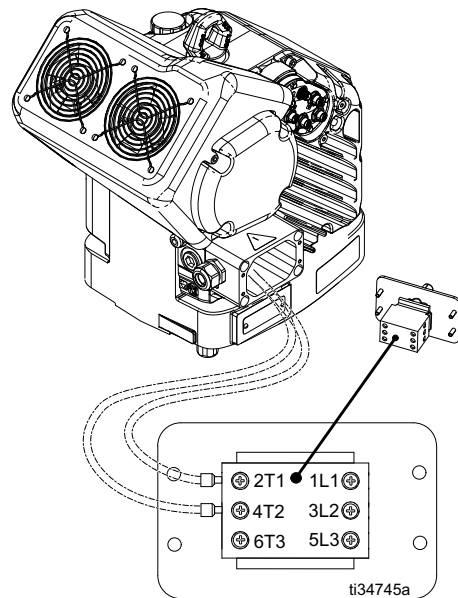
**FIG. 2: Power Cord**

2. Bring the cord to the unit. Remove four screws to separate the junction box cover (DA) and the attached power disconnect switch (D) from the junction box (DB).



**FIG. 3: Power Disconnect Switch**

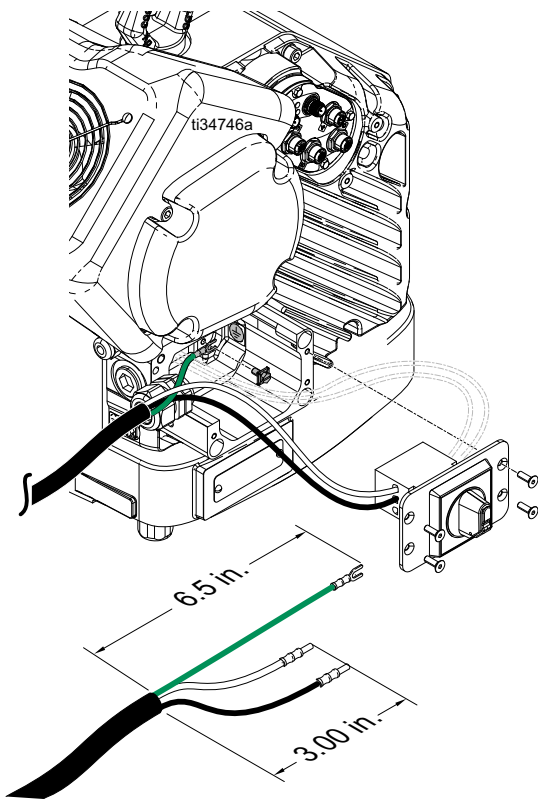
3. With the power disconnect switch (D) and the junction box cover (DA) detached from the driver, verify that the wires inside the junction box are installed as seen in FIG. 4.



**FIG. 4: Terminal Connections**

4. Insert power cord (from step 1) through the cord grip and into the junction box.
5. Install power wires into terminals 1L1 and 3L2. See FIG. 4.

- Attach the ground wire to the ground terminal inside of the junction box.



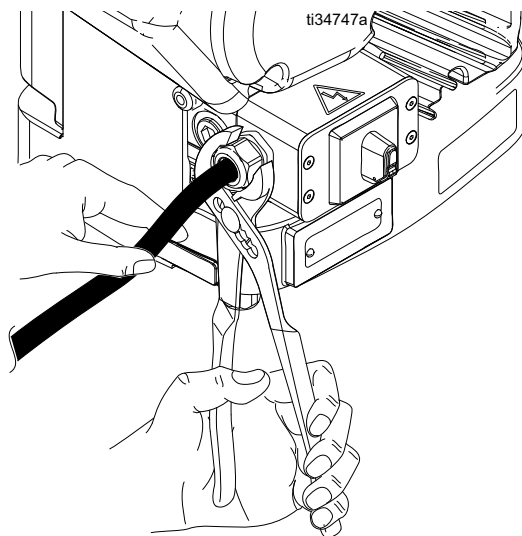
**FIG. 5: Ground Wire and Ground Terminal**

- Place the wires into the open area on either side of the disconnect block, as space permits. Reinstall the junction box cover.

**NOTICE**

If wires are pinched during screw installation, damage to wires will occur. Damaged wires may prevent the connected components from functioning properly. Make sure all wires are routed correctly before installation.

- Replace the junction box screws. Tighten the cord grip to securely hold the power cord in the junction box.



**FIG. 6: Junction Box Screws and Strain Relief**

## Grounding

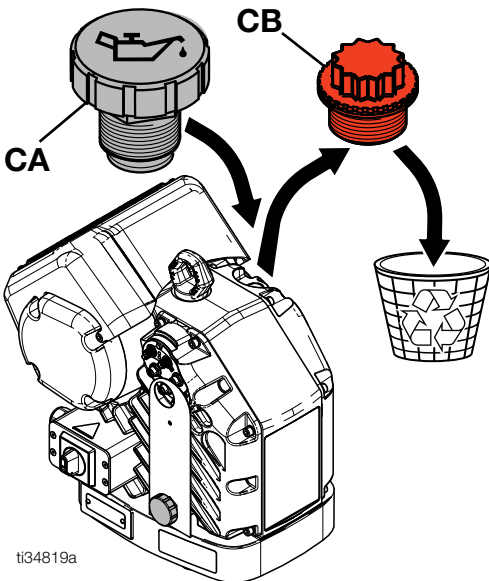
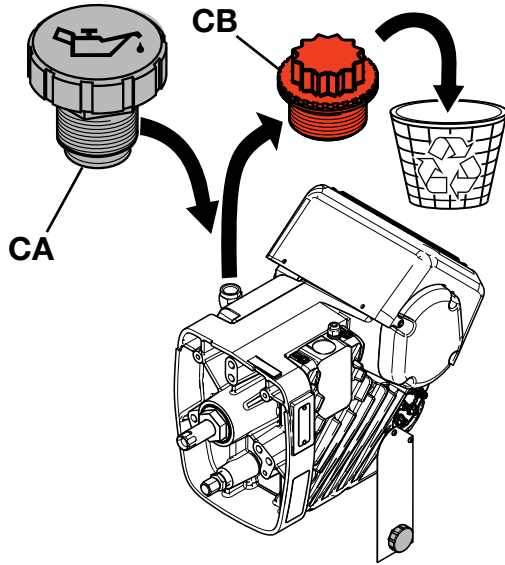


The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.

**Driver:** the driver is grounded through the power cord.

## Install Vented Oil Cap Before Using Equipment

The driver gear-box is shipped from the factory pre-filled with oil. The temporary unvented cap (CB) prevents oil leaks during shipment. This temporary cap must be replaced with the vented oil cap (CA), supplied with the equipment, before use.



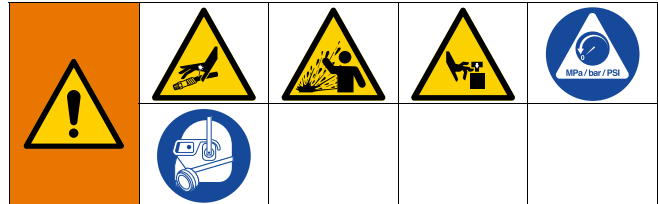
ti34819a

**FIG. 7: Unvented and Vented Oil Caps**

## Pressure Relief Procedure



Follow the Pressure Relief Procedure whenever you see this symbol.



This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as skin injection, splashing fluid and moving parts, follow the Pressure Relief Procedure when you stop spraying and before cleaning, checking, or servicing the equipment.

1. Turn the power disconnect switch (D) to off to remove power to the electric driver.
2. Relieve all fluid pressure. Follow the Pressure Relief Procedure in your separate system manual.

**NOTE:** Turning off the electric driver does not relieve pressure in connected pumps.

## Operation

Refer to your system manual for operating instructions.

**NOTE:** The APD20 electric driver is operated using external electronic controls.



# Maintenance

## NOTICE

Do not open or remove the gear cover. The gear side is not intended to be serviced. Opening the gear cover may alter the factory-set bearing pre-load and may reduce the product life.

## Preventive Maintenance Schedule

The operating conditions of your particular system determine how often maintenance is required. Establish a preventative maintenance schedule by recording when and what kind of maintenance is needed, and then determine a regular schedule for checking your system.

## Check the Oil Level

Check the oil level in the sight glass (B). The oil level should be near the halfway point of the sight glass when the sprayer is not running. If the oil is low, open the fill cap (C) and add Graco Part No. 16W645, ISO 220 silicone-free synthetic EP gear oil. Reinstall the fill cap.

**NOTE:** The oil capacity for vertical models is approximately 1.0-1.2 quarts (0.9-1.1 L). The oil capacity for horizontal models is 2.0-2.2 quarts (1.9-2.1 L). Do not overfill.

## NOTICE

Only use oil with Graco part number 16W645. Any other oil may not lubricate properly and can cause damage to the drive train.

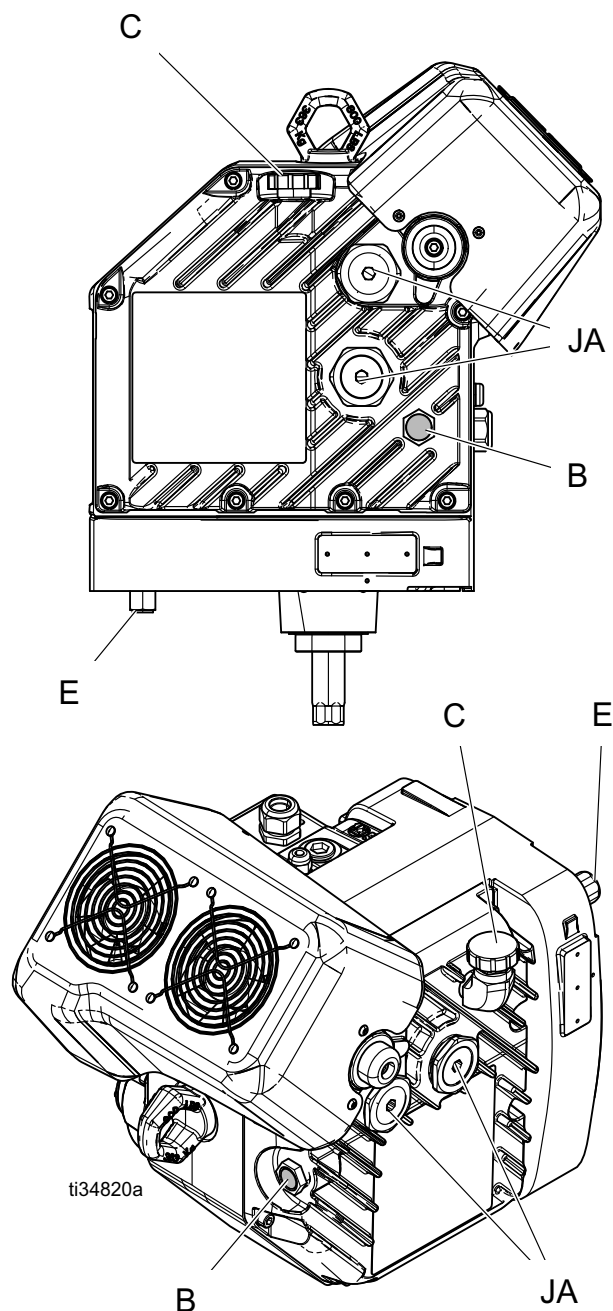


FIG. 8: Sight Glass and Oil Fill Cap

## Change the Oil

**NOTE:** Change the oil after a break-in period of 200,000 to 300,000 cycles. After the break-in period, change the oil once per year.

1. Place a minimum 2 quart (1.9 L) container under the oil drain port. Remove the oil drain plug (E). See FIG. 8. Allow all oil to drain from the driver.
2. Reinstall the oil drain plug (E). Torque to 18-23 ft-lb (25-30 N•m).
3. Open the fill cap (C) and add Graco Part 16W645, ISO 220 silicone-free synthetic EP gear oil. Check the oil level in the sight glass (B). Fill until the oil level is near the halfway point of the sight glass. Do not overfill.

**NOTE:** The oil capacity for vertical models is approximately 1.0-1.2 quarts (0.9-1.1 L). The oil capacity for horizontal models is 2.0-2.2 quarts (1.9-2.1 L).

4. Reinstall the fill cap.

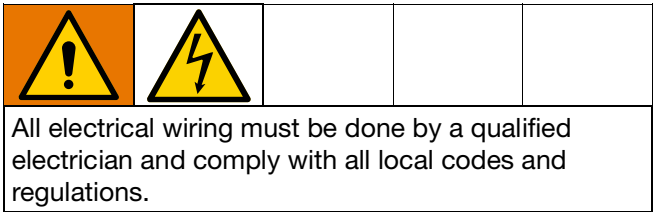
## Bearing Pre-Load

See FIG. 8. The bearing pre-loads (JA) are factory-set.

### **NOTICE**

Only adjust the bearing pre-load if a gear stage has been replaced. Improper adjustment of the bearing pre-load may cause premature failure of the gear or housing. See **Replace Gear and Output Shaft**, page 15.

# Repair



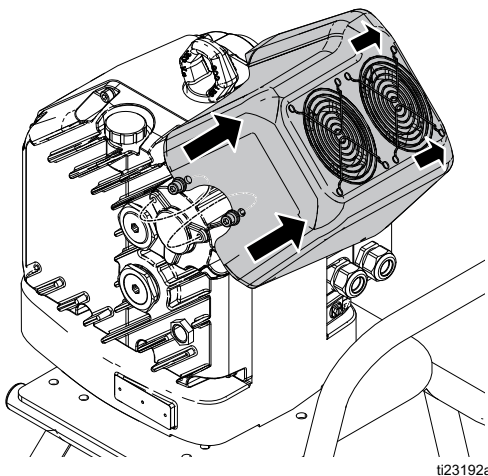
## Replace Fan Assembly



**NOTE:** The replacement fan assembly kit (26B025) must be purchased separately.

Tools required:

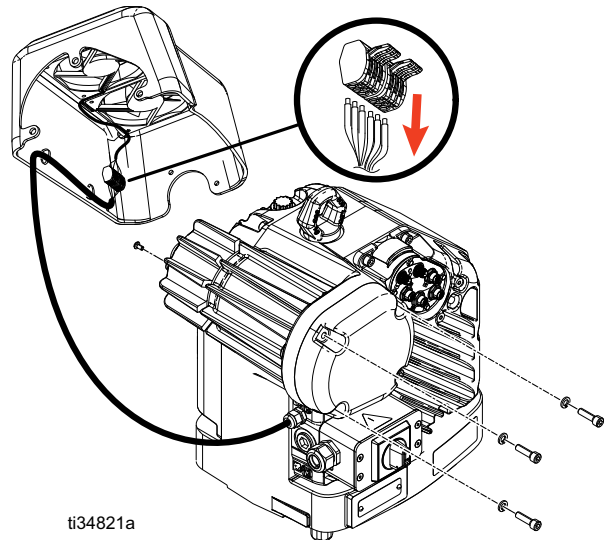
- 3 mm hex wrench
  - 6 mm hex wrench
  - 15 ft-lb (20 N•m) torque wrench
  - Medium (blue) thread-locking compound
1. Relieve pressure. Perform the **Pressure Relief Procedure**, page 8.
  2. Verify that the driver power disconnect switch (D) is turned off. Disconnect the unit from the power source.
  3. Remove the screws that attach the fan assembly to the driver. Pull up on the end farthest from the junction box. Slide the assembly toward the junction box to remove.



ti23192a

**FIG. 9: Remove Fan Assembly**

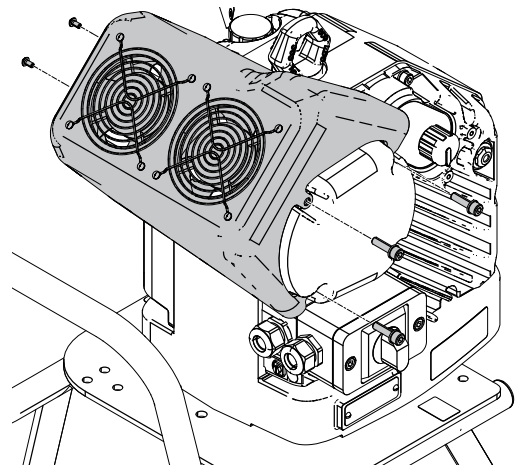
4. Underneath the fan shroud, disconnect the fan cable using the two lever-lock connectors.



ti34821a

**FIG. 10: Remove Wires**

5. Remove the fan cable from the old fan assembly.
6. Connect the fan cable to the new fan assembly using the two lever-lock connectors. Connect the red leads into one lever-lock connector. Connect the black leads into the other connector. Secure the fan cable along the inside of the fan shroud.
7. Install the new fan assembly. To attach the new fan assembly, slide the cover tabs into the slots on the junction box side. Gently push down the far end. Apply thread locker and install the supplied fasteners and washers. Torque to 15 ft-lb (20 N•m).



ti23193b

**FIG. 11: Install Fan Assembly**

## Replace Electronics Cover



### Remove Electronics Cover

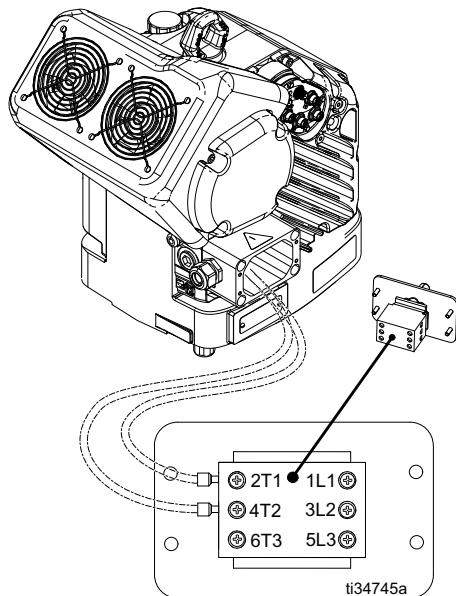
Tools required:

- 3 mm hex wrench
- 6 mm hex wrench
- 15 ft-lb (20 N•m) torque wrench

1. Relieve pressure. Perform the **Pressure Relief Procedure**, page 8.
2. Verify that the driver power disconnect switch (D) is turned off. Disconnect the unit from the power source.
3. Disconnect the lower from the driver. Refer to your system manual.

**NOTE:** You must remove the lower from the driver in order to calibrate the driver.

4. Remove four screws. Remove the junction box cover.

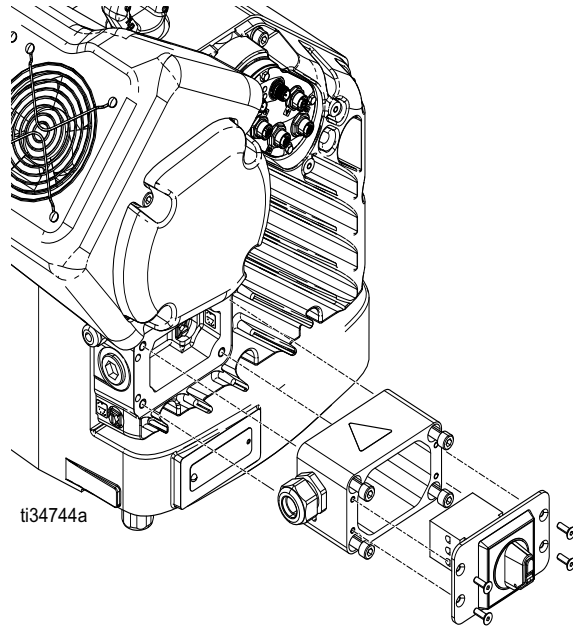


**FIG. 12: Junction Box Cover**

5. Loosen the cord screws on the disconnect block. Disconnect wires from 2T1 and 4T2.

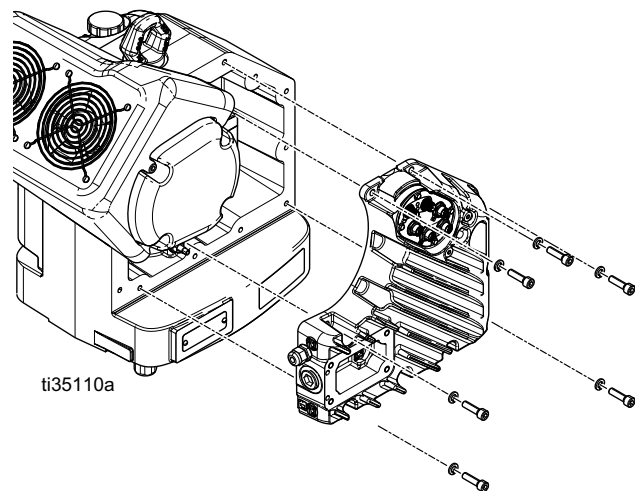
**NOTE:** Power cord cables (except for the ground wire) may remain attached.

6. Remove four bolts, four washers, and the junction box sleeve.



**FIG. 13: Junction Box Sleeve**

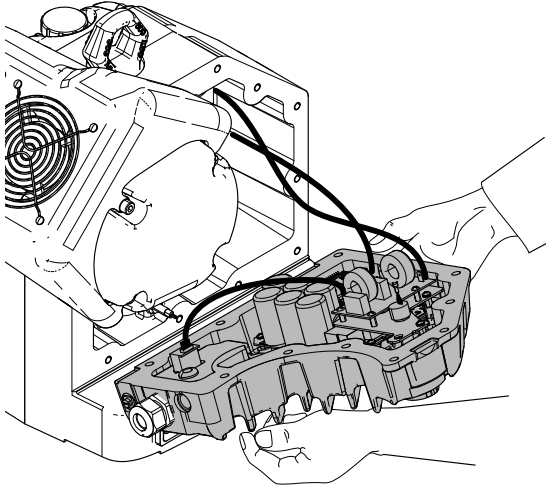
7. Remove six screws and washers from the electronics cover.



**FIG. 14: Remove Electronics Cover**

8. Carefully tilt the electronics cover down.

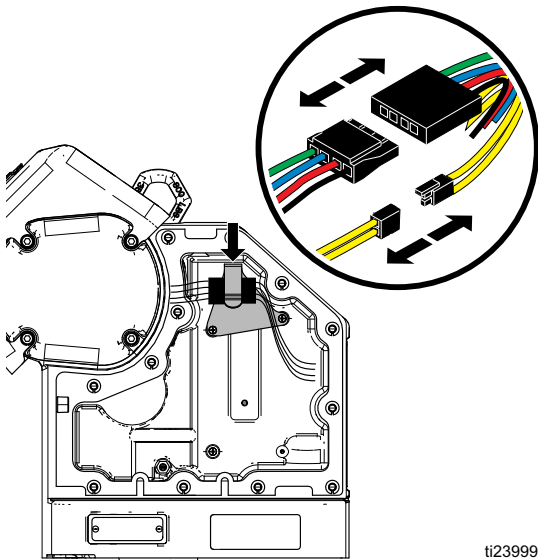
**NOTICE**  
All wires must be disconnected before the cover is completely removed. To avoid damaging the wires and connections, hold the cover in place or let the cover rest on a work surface while disconnecting wires.



ti23998a

**FIG. 15: Tilt Electronics Cover**

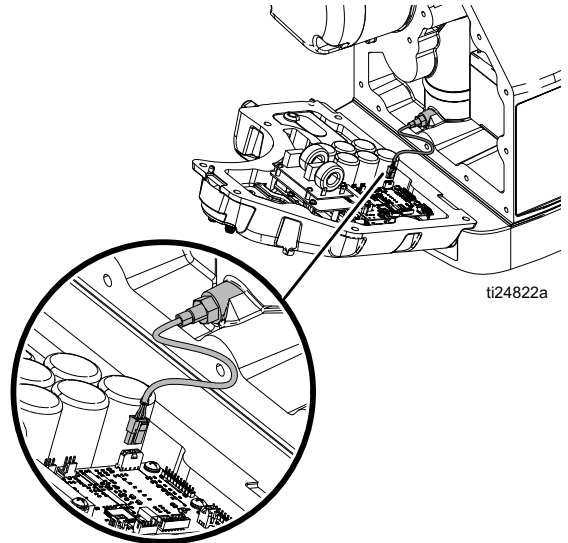
9. Pull the wire connectors out. Disconnect the motor power and motor temperature wires.



ti23999a

**FIG. 16: Motor Power and Motor Temperature Wires**

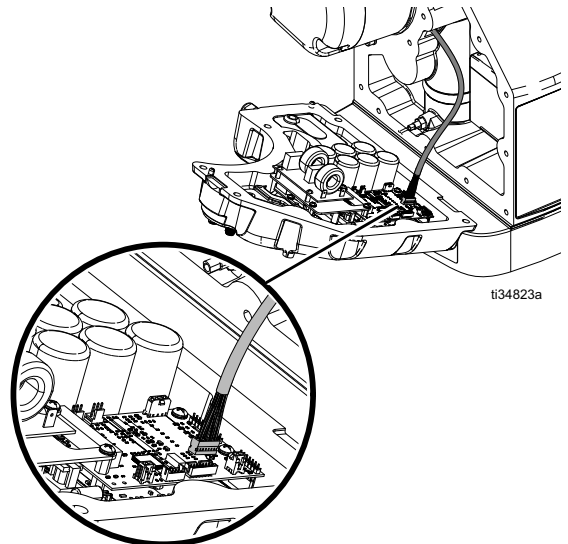
10. Disconnect the stroke position sensor wire.



ti24822a

**FIG. 17: Stroke Position Sensor Wire**

11. Disconnect the encoder wire.



ti34823a

**FIG. 18: Encoder Wire**

12. Discard the electronics cover.

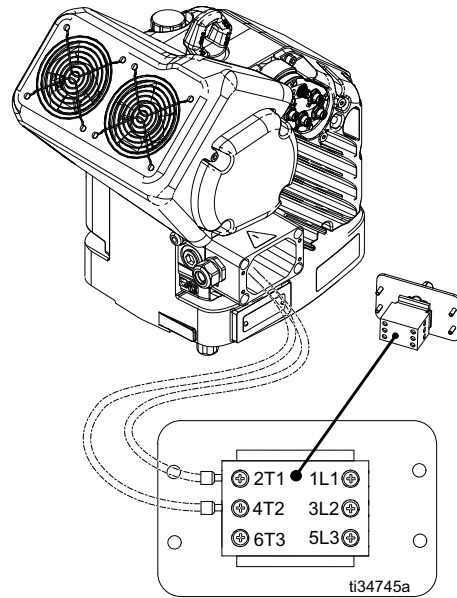
## Install Electronics Cover

1. Connect the encoder wire and stroke position sensor wire to the new electronics cover.
2. Connect the motor power and motor temperature wires.
3. Install the electronics cover and 6 screws. Torque the screws to 15 ft-lb (20 N•m).

### NOTICE

If wires are pinched during screw installation, damage to wires will occur. Damaged wires may prevent the connected components from functioning properly. Make sure all wires are routed correctly before installation.

4. Install the junction box sleeve. Tighten the four bolts.
5. Install the junction box cover. Tighten the four screws.
6. Install the power leads from the electronics cover into the power disconnect switch. Install the brown lead into terminal 2T1 and the blue lead into terminal 4T2.



**FIG. 19: Install Wires**

7. Connect the power cord.
8. Turn the power disconnect switch to ON.
9. Update the electric driver software. See **Update Software**, page 22.
10. **Calibrate the Electric Driver.** See page 15.

## Calibrate the Electric Driver



1. Perform the **Pressure Relief Procedure**. See page 8.
2. Disconnect the lower from the driver. Refer to your system manual.

**NOTE:** The lower must be removed from the system in order to calibrate correctly. The calibration stroke length is longer than the operating stroke. Leaving the lower attached will allow the driver rod to contact the lower rod and cause incorrect calibration.

3. Cycle power to the driver. Turn the power disconnect switch to OFF, then turn the power disconnect switch to ON.
4. Begin calibration. Refer to your system manual for instructions.
5. Wait for the calibration process to finish.
  - a. The driver output shaft (18) will run up and down slowly over the course of several minutes.
  - b. Midway through the auto-calibration process, the driver output shaft will pause as it moves to the next step.
  - c. The driver output shaft will move up and down five to six times at a faster pace.
6. Verify that the auto-calibration process is complete before returning to normal operation.

**NOTE:** The system display will indicate the success or failure of the auto-calibration process.

## Replace Gear and Output Shaft



In the event of a gear train failure, including any gear or the rack, it is highly recommended that the mating component is also replaced. It is possible that the failed component may have damaged its mating component and therefore may reduce the life of both components. It is also recommended to inspect the entire gear train at this time for any other damage. Replace any components which look excessively worn or damaged.

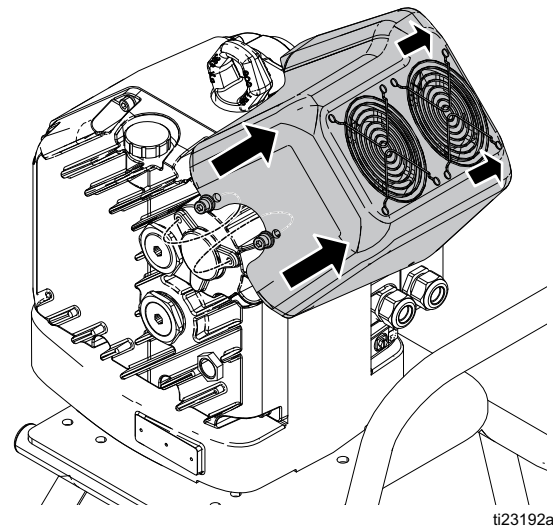
**NOTE:** The replacement gear kit (26A398) and the replacement output shaft kit (26A399) must be purchased separately.

Tools required:

- 3 mm hex wrench
- 4 mm hex wrench
- 6 mm hex wrench
- 1/4 in. hex wrench
- 2 in. open-ended wrench
- 175 ft-lb (240 N•m) torque wrench
- 150 in-lb (17 N•m) torque wrench
- Medium (blue) thread-locking compound
- Grease

## Remove the Fan and Gear Cover

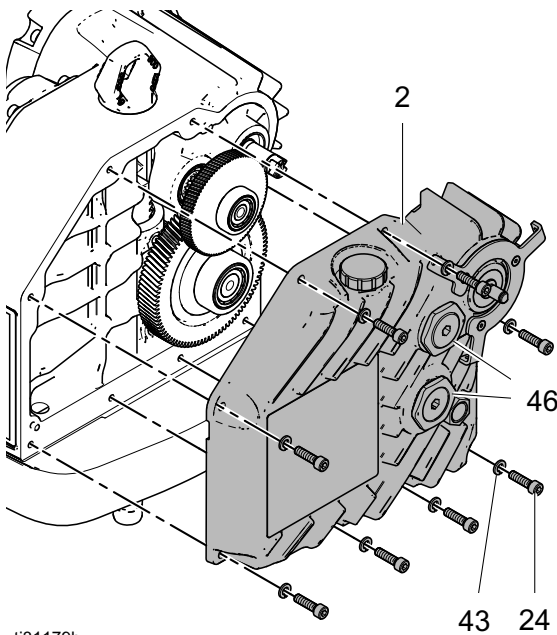
1. Follow steps 1-4 in **Replace Fan Assembly**, page 11.



ti23192a

**FIG. 20: Remove Fan Assembly**

2. Drain oil from the gear box. Follow steps 1 and 2 of **Change the Oil** (page 10).
3. Using a 2 in. wrench, loosen the gear jam nuts (46) on the outside of the gear cover for later removal. See FIG. 21.
4. Remove the eight 6 mm hex screws (24) and washers (43) from the gear cover (2).
5. The gear cover is mounted on two dowels. Pull the cover straight out to remove the cover.



ti31179b

**FIG. 21: Remove Gear Cover**

### Remove the First Stage Gear

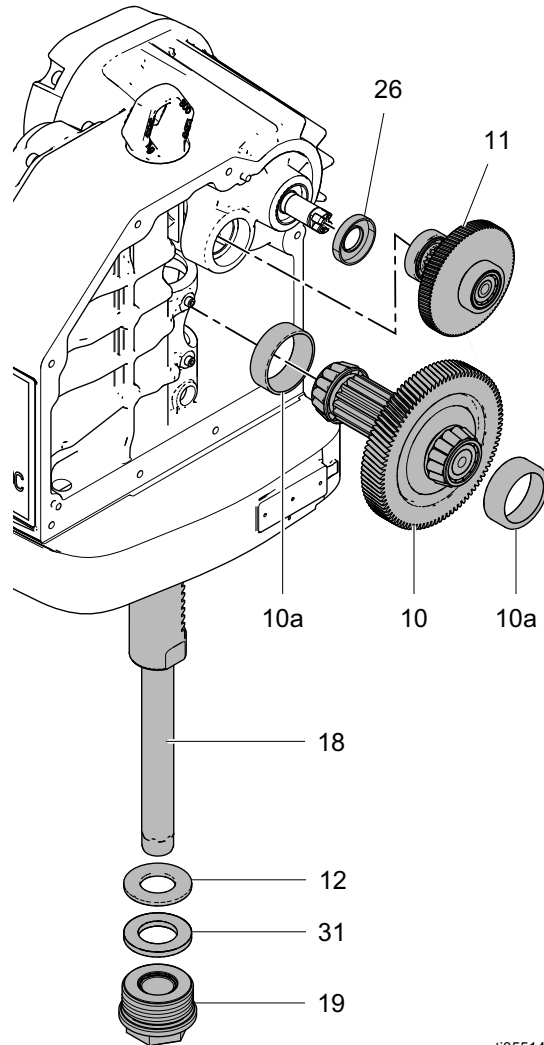
Pull out the first stage gear (11).

**NOTE:** As necessary, push the second stage gear (10) aside to release the first stage gear.

### Remove the Second Stage Gear and Output Shaft

1. Turn the second stage gear (10) clockwise so the output shaft (18) is as high as possible in the motor housing.
2. Using a 2 in. wrench, loosen the output shaft bearing (19).
3. While holding the gear in place, remove the bearing, lower bumper (31), and support washer (32) from the output shaft.

4. To remove the output shaft, grasp the shaft while rotating the second stage gear (10) counterclockwise.
5. Remove the output shaft and second stage gear at the same time.



ti35514a

**FIG. 22: Remove Output Shaft and Gear**

### Replace the Rotor Shaft Seal

1. If necessary, remove the input shaft seal (26) from the gear side of the motor housing.
2. Install the new seal.

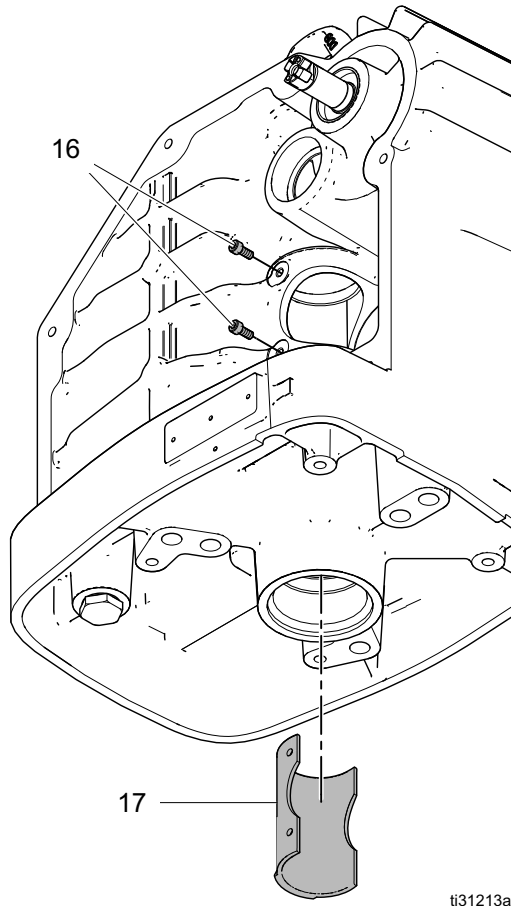
### Replace the Bearing Race

Remove the second stage gear bearing race (10a) from the motor housing. Replace with gear bearing race with a new race from the replacement kit.



## Remove the Rack Bearing

Remove the two 4 mm hex screws (16) holding the rack bearing (17) in place. To remove the bearing, slide it sideways to release the snap feature. Then slide the bearing down through the bottom of the output shaft.



ti31213a

**FIG. 23: Remove Rack Bearing**

## Install the Rack Bearing

1. Put gear grease on the back of the rack bearing. Slide the bearing into the motor housing until the lip on the bottom of the bearing snaps into place.
2. Line up the holes in the rack bearing with the holes in the motor housing.
3. Apply blue thread-locking compound to the rack bearing screws (16). Insert the screws through the motor housing holes and into the bearing. Torque to 10 in-lbs (3 N•m).

## Install the Output Shaft and Second Stage Gear

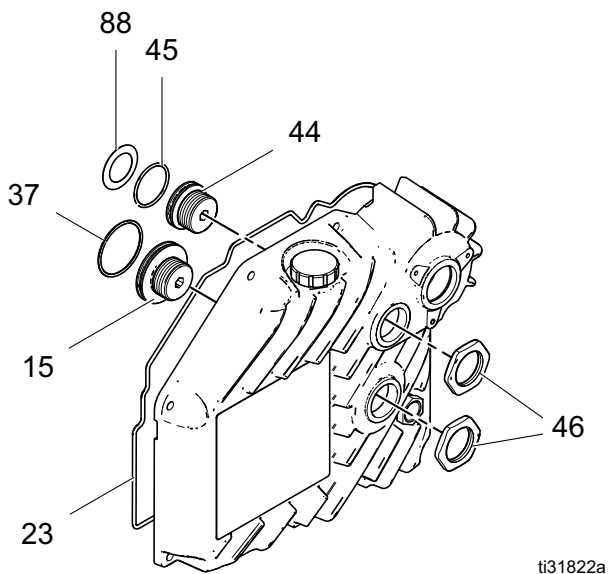
1. Grease the threads and o-ring of the output shaft bearing (19).
2. Apply gear oil or grease to the back of the output shaft (18). Insert the output shaft into the motor housing (1).
3. Hold the output shaft while inserting the second stage gear (10). Line up the gears of the shaft and gear so they mesh.
4. Turn the gear clockwise until the output shaft has risen as high as possible. Hold the gear in place.
5. Slide the support washer (32), bumper (31), and output shaft bearing (19) onto the output shaft (18) as far as possible. Hand tighten, then torque to 175 ft-lb (240 N•m).

## Install the First Stage Gear

1. Slide the first stage gear and bearings (11) into the motor housing (1).
2. Line up the first stage gear with the second stage gear (10) to allow the gears mesh together.

## Replace the Bearing Adjuster O-Rings

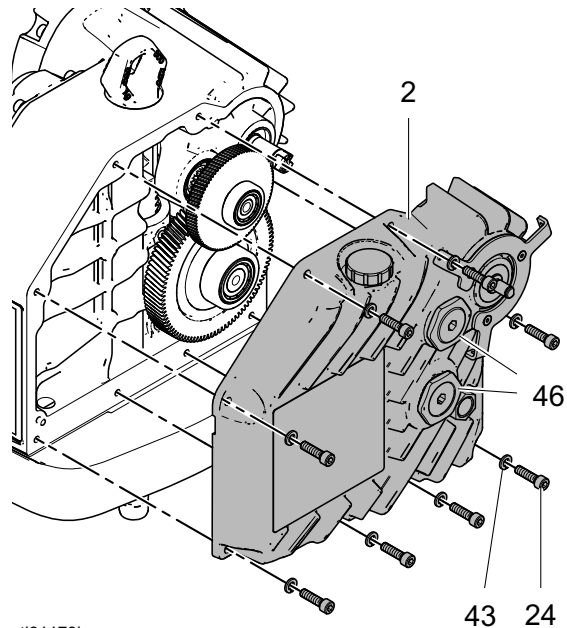
1. Remove the loosened jam nuts (46) from the outside of the gear cover.
2. Using a 1/4 in. hex wrench, remove the gear adjusters (15, 44) from the inside of the gear cover.
3. Remove the o-rings (37, 45). Clean the bearing adjuster threads.
4. Put the new o-rings (37, 45) on the bearing adjusters.
5. Grease the o-ring area of both bearing adjusters.
6. Apply thread sealant on the threads of the adjusters.
7. Use a 1/4 in. hex wrench to install each adjuster into the appropriate hole.



**FIG. 24: Gear Cover**

## Install the Gear Cover

1. Remove and replace the gear cover gasket (23). Before pressing the gasket into place, grease three or four places on the gasket groove of the gear cover.
2. Place the gear cover (2) on the motor housing. Secure the gear cover with either 6 mm hex screws (24) and washers (43). Torque to 15 ft-lb (20 N•m).



ti31179b

**FIG. 25: Install Gear Cover**

3. Torque the second stage adjuster (15) clockwise to 150 in-lbs (17 Nm). Back off several turns counterclockwise, and then torque the second stage adjuster clockwise to 100 in-lbs (11 Nm).
4. Torque the first stage adjuster (44) clockwise to 100 in-lbs (11 Nm). Back off several turns counterclockwise, and then torque the first stage adjuster clockwise to 70 in-lbs (8 Nm).
5. With a 2 in. open-ended wrench, screw the jam nuts into the outside of the gear cover. Torque to 40 ft-lbs (54 Nm).
6. Fill the gear box with oil. Follow steps 3 and 4 of **Change the Oil**. See page 10.

## Install the Fan

Follow step 6 and 7 of **Replace Fan Assembly**, page 11.

## Replace the Shaft Bearing Assembly

**NOTE:** The replacement shaft bearing assembly kit (25C164) must be purchased separately.

Tools required:

- 2 in. open-ended wrench
  - 175 ft-lb (240 N•m) torque wrench
1. Stop the pump at the bottom of its stroke. Turn the power disconnect switch to OFF.
  2. Perform the **Pressure Relief Procedure**, page 8.
  3. Disconnect the lower from the driver. Refer to your system manual for instructions.
  4. Drain the oil from the driver. See steps 1-2 of **Change the Oil**, page 10.
  5. Unscrew the shaft bearing assembly (19) from the driver. See FIG. 22, page 16.
  6. Install the new shaft bearing assembly. Torque to 175 ft-lb (240 N•m).
  7. Fill the driver with oil. See steps 3-4 of **Change the Oil**, page 10.
  8. Reconnect the lower to the driver. Refer to your system manual for instructions.
  9. Turn the power disconnect switch to ON and resume operation.

## Replace the Motor Rotor and Encoder



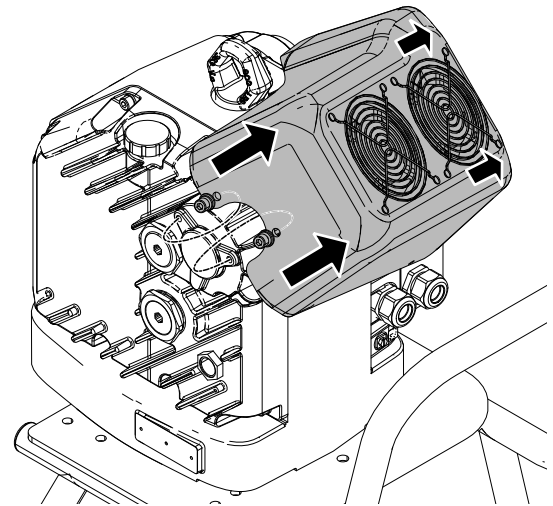
**NOTE:** The replacement motor rotor kit (26C547), the replacement encoder kit (24U938), and the replacement encoder fastener kit (2008772) must be purchased separately.

Tools required:

- 4 mm hex wrench
- 6 mm hex wrench
- 1/2 in. or 13 mm socket or open-ended wrench
- 0.050 in. hex bit with 1/4 in. drive (included) or 0.050 in. torque blade
- #1 phillips screwdriver
- 15-20 ft-lb (20-27 N•m) torque wrench
- 100 in-lb (11 N•m) torque wrench
- 80 in-oz (5 in-lb) torque screwdriver
- Medium (blue) thread-locking compound
- 16W645 gear oil or compatible grease
- Loctite 248 (blue)

## Remove the Fan and the Motor Cover

1. Follow steps 1-4 of **Replace Fan Assembly**. See page 11. Set aside the fan assembly.

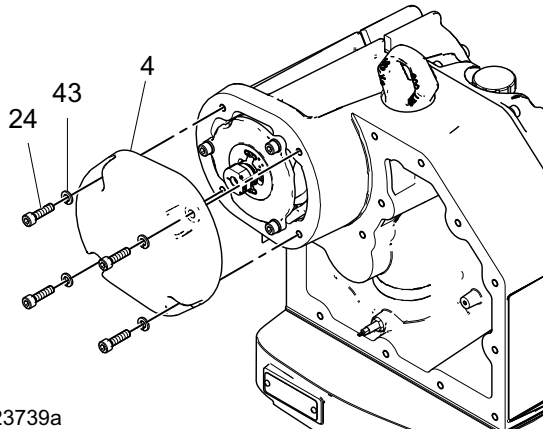


ti23192a

**FIG. 26: Remove the Fan Assembly**

2. Use a 6 mm hex wrench to remove the four bolts (24) and washers (43) that secure the motor cover (4). See FIG. 27, page 20.

- Remove the motor cover (4).



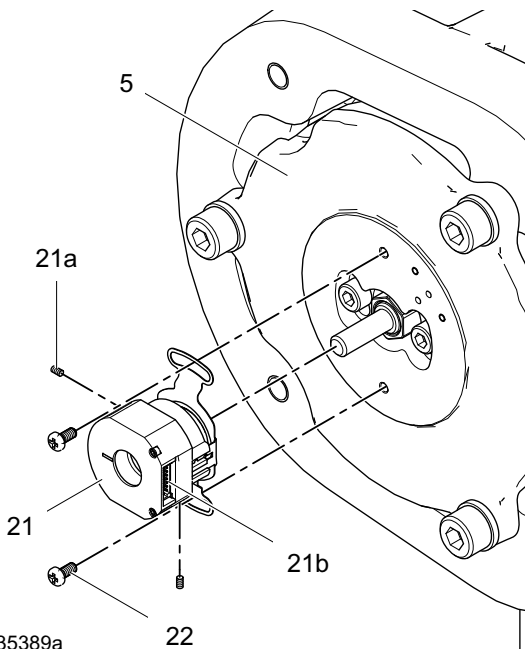
ti23739a

**FIG. 27: Remove the Motor Cover**

### Remove the Encoder

**NOTE:** If using the encoder fastener kit (2008772), skip to step 5 in **Install the Encoder** section.

- Unplug the cable from the encoder (21).
- Using the 0.050 in. hex bit, loosen the two hub set screws (21a) on the sides of the encoder. Do not remove the screws.



ti35389a

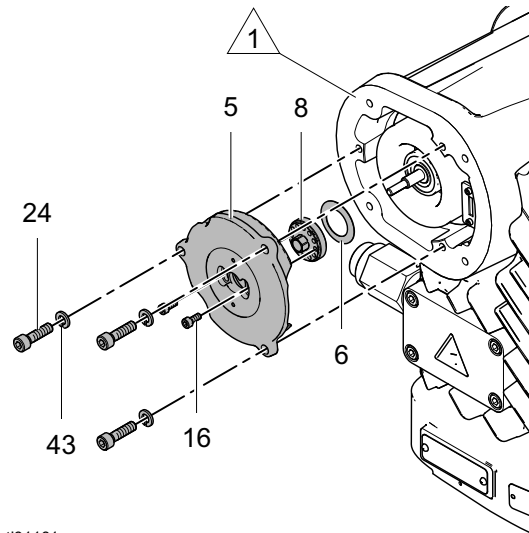
**FIG. 28: Encoder**

- Use a phillips head screwdriver to remove the two encoder mounting screws (22).
- Pull the encoder off of the rotor support (5).

**NOTE:** If only the encoder needs to be replaced, see **Install the Encoder**, page 21.

### Remove the Rotor

- Use a 6 mm wrench to remove three screws (24) and washers (43) from the rotor support (5). Be careful not to scratch any surfaces.



ti31161a

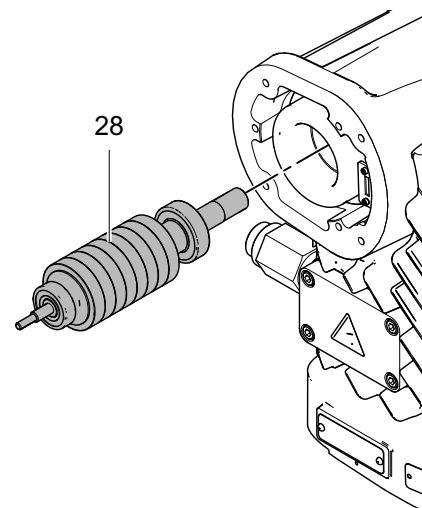
**1** Do not damage the surface.

**FIG. 29: Remove the Rotor Support**

- Manually pull the rotor (28) out of the stator.

### NOTICE

The rotor is a very strong magnet. Keep it away from sensitive equipment such as cell phones, cameras, credit cards, and so on.

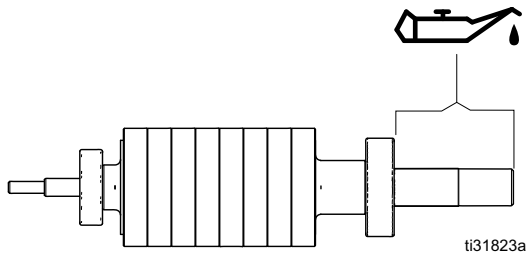


ti31162a

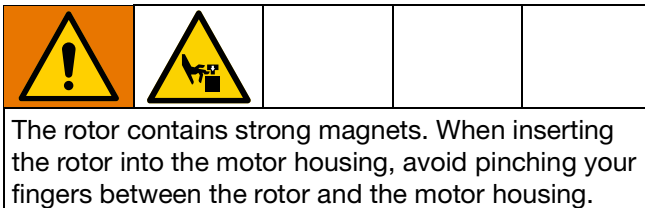
**FIG. 30: Remove the Rotor**

## Install the Rotor

- Grease the shaft of the rotor (28).



**FIG. 31: Grease the Rotor Shaft**



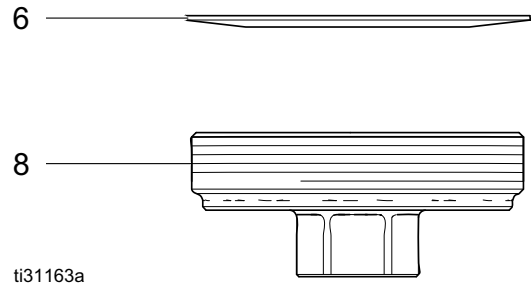
- Insert the rotor into the motor housing by holding the bearing. The rotor will pull itself into place due to the strength of the magnets.

### NOTICE

Make sure the rotor seats properly and does not impact the motor housing or stator during insertion. Improper rotor installation may cause gear failure or damage to the rotor.

- Remove the two 4 mm locking screws (16) that secure the rotor adjuster (8) to the rotor support (5). Keep the rotor adjuster in place in the rotor support.
- Place a 1/2 in. or 13 mm socket or open-ended wrench in the outside center hole of the rotor support. Turn the wrench clockwise to loosen the position of the rotor adjuster.

- Place the spring disc (6) on the rotor shaft. See FIG. 32.



**FIG. 32: Place Spring Disc on Rotor Shaft**

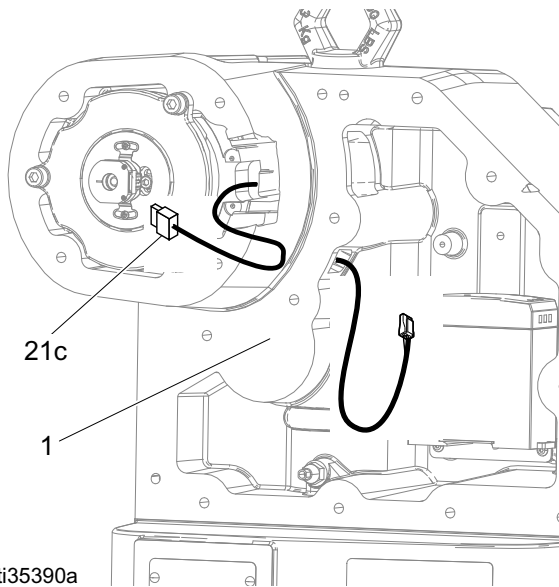
- Replace the rotor support (5). Install the three screws (24) and washers (43). Torque to 15 ft-lb (20 N•m).
- To set the rotor, tighten the rotor adjuster to 100 in-lbs (11 N•m) in the clockwise direction. Back out several turns counterclockwise, then tighten the rotor adjuster to 15 in-lbs (1.5 N•m).
- Install the two locking screws (16). Torque to 30 in-lbs (3 N•m).

## Install the Encoder

- If necessary, replace the encoder cable:
  - Follow steps 1-8 of **Remove Electronics Cover** (page 12).
  - Disconnect both ends of the existing encoder cable. Discard the existing cable.
- Route the encoder cable (21c) through the lower port of the motor housing (1).

**NOTE:** The replacement encoder cable is supplied with the replacement encoder kit (24U938).

**NOTE:** The encoder connector is the smaller of the two connections.



**FIG. 33: Route Encoder Cable**

3. Slide the new encoder onto the rotor shaft.
4. Apply a small amount of medium (blue) thread locker to the two phillips head mounting screws (22). Secure the encoder to the rotor support (5). Torque to 5 in-lb (0.56 N•m).
5. Using the included 0.050 in. hex bit, remove the two set screws (21a) from the encoder hub.
6. Apply a small amount of medium (blue) Loctite 248 to the set screws (21a). Install the screws into the encoder. Tighten to 80 in-oz (5 in-lb) using a torque screwdriver.

**NOTE:** Be careful not to drop the small set screws.

**NOTE:** Do not apply thread locker to the encoder hub itself. Do not apply excessive amounts of thread locker. Wipe away any excess thread locker on the encoder hub. Sealant must be allowed to cure before use.

7. Plug the encoder cable into the encoder and the control board. See **Wiring Diagram**, page 31.
8. If the electronics cover was removed, re-install the electronics cover. See **Install Electronics Cover**, page 14.
9. **Install the Motor Cover.** See page 22.

### Install the Motor Cover

1. Install the motor cover (4) onto the motor housing. See FIG. 27, page 20.
2. Use a 6 mm hex wrench to install the four bolts (24) and washers (43) that hold the motor cover in place. Torque the bolts to 15 ft-lb (20 N•m).
3. Install the fan assembly. See steps 6 and 7 of **Replace Fan Assembly**, page 11.
4. **Calibrate the Electric Driver.** See page 15.
5. Re-connect the lower to the electric driver. Refer to your system manual for instructions.

### Update Software

Refer to your system or system software manual for the software update procedure.

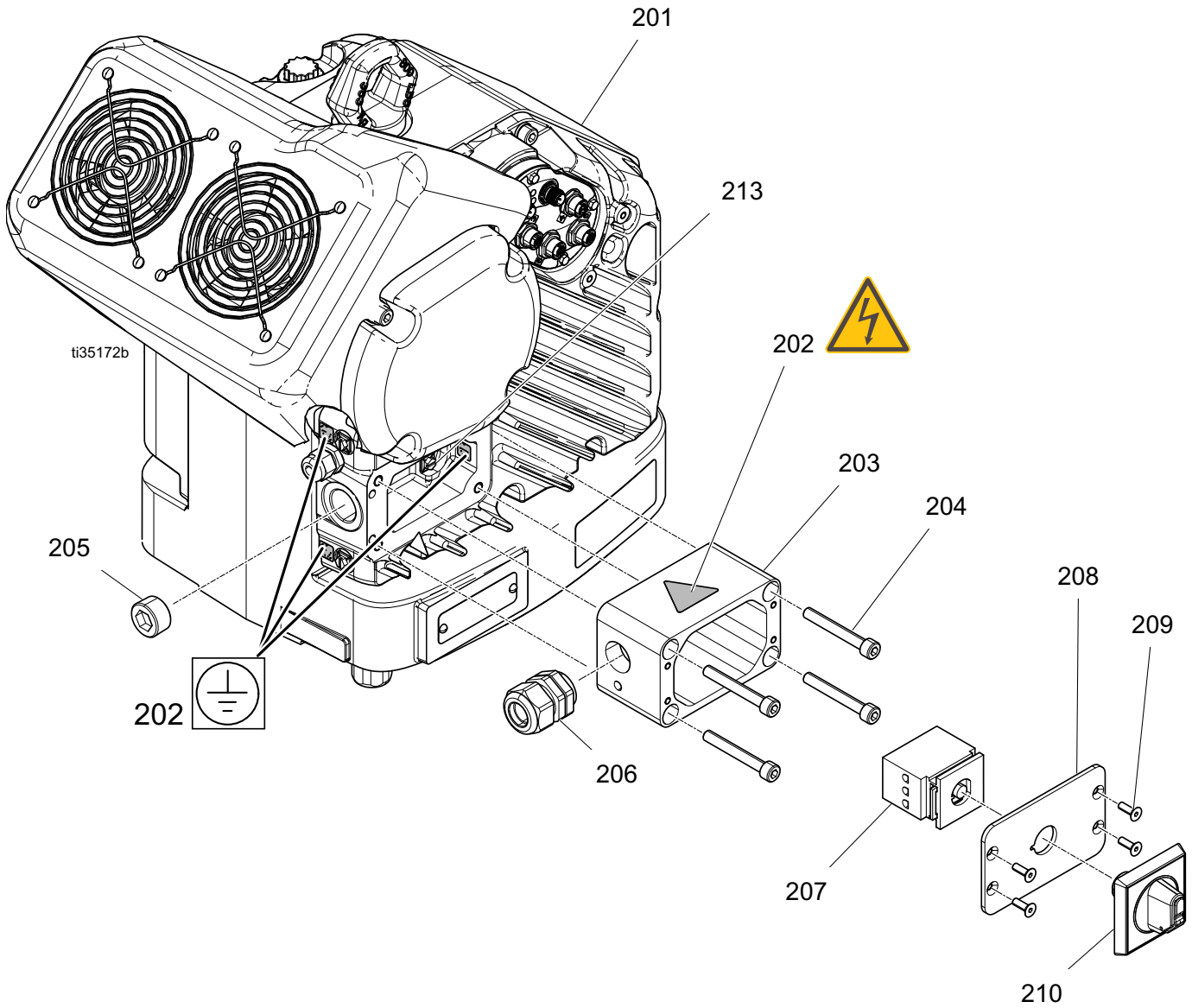
**NOTE:** Software updates require a Graco electronic display or control, such as an ADM (Advanced Display Module).



# Parts

## Vertical Electric Driver (25N519)

## Horizontal Electric Driver (25N520)



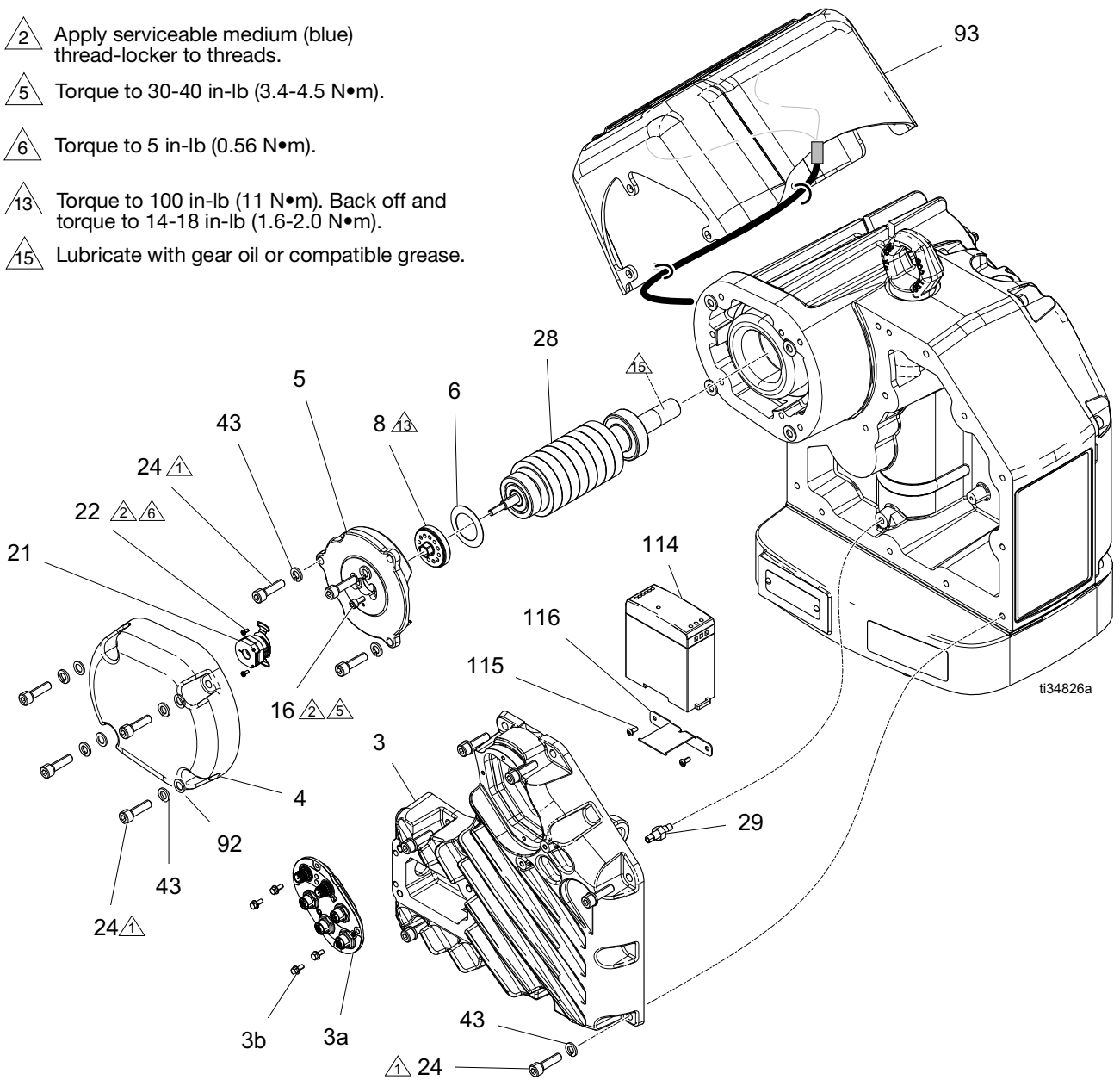


Ref.	Part	Description	Qty.	
			25N519	25N520
201	-----	DRIVER, APD20, horizontal		1
	-----	DRIVER, APD20, vertical	1	
202▲	16T764	LABEL, warning	1	1
203	17X387	BOX, junction, power, motor, APD	1	1
204	117080	SCREW, socket head, m8 x 60	4	4
205	102726	PLUG, pipe headless	1	1
206	121171	GRIP, cord, 0.35-0.63, 3/4	1	1
207	123970	SWITCH, disconnect, 40 A	1	1
208	130692	COVER, junction box, APD motor	1	1
209	113768	SCREW, socket, flat head	4	4
210	130729	KNOB, disconnect, panel, black	1	1
213	116343	SCREW, ground	4	4

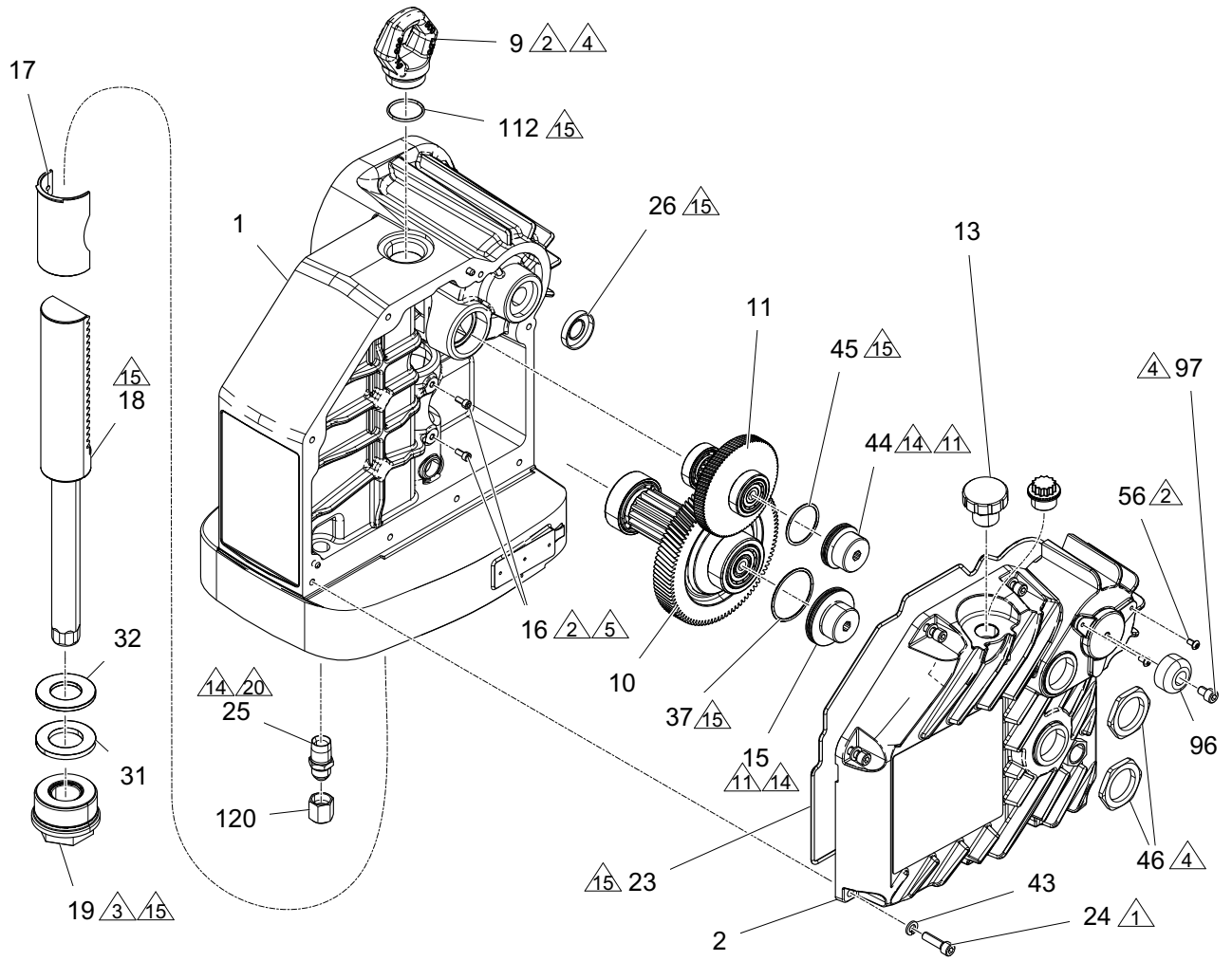
▲ Replacement safety labels, tags, and cards are available at no cost.

# Electrical Enclosure

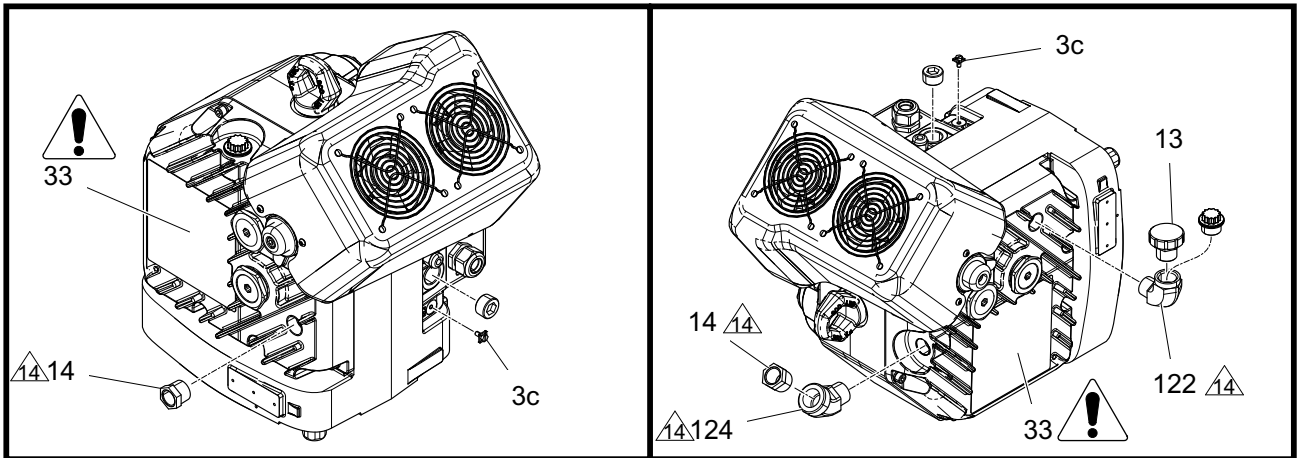
- 1 Torque to 15-20 ft-lb (20-27 N•m).
- 2 Apply serviceable medium (blue) thread-locker to threads.
- 5 Torque to 30-40 in-lb (3.4-4.5 N•m).
- 6 Torque to 5 in-lb (0.56 N•m).
- 13 Torque to 100 in-lb (11 N•m). Back off and torque to 14-18 in-lb (1.6-2.0 N•m).
- 15 Lubricate with gear oil or compatible grease.



# Gear Box



ti34827a



Parts

1 Torque to 15-20 ft-lb (20-27 N•m).

6 Torque to 5 in-lb (0.56 N•m).

2 Apply serviceable medium (blue) thread-locker to threads.

11 After the gear cover (2) is installed, torque the adjuster (15) to 150 in-lb (17 N•m). Back off and torque to 100-120 in-lb (11-12 N•m). Then torque adjuster (44) to 100 in-lb (11 N•m). Back off and torque to 70-80 in-lb (8-9 N•m).

3 Torque to 175-200 ft-lb (240-280 N•m).

14 Torque to 100 in-lb (11 Nm). Back off and torque to 14-18 in-lb (1.6-2.0 N•m).

4 After the gear train is assembled, torque both lock nuts to 40-50 ft-lb (240-280 N•m).

15 Lubricate with gear oil or compatible grease.

5 Torque to 30-40 in-lb (3.4-4.5 N•m).

Ref.	Part	Description	Qty.	
			25N519	25N520
1	-----	HOUSING, main	1	1
2★✓	-----	COVER, gear	1	1
3	26B024	COVER, electronics, assembly, 25N520 (horizontal)		1
	26B023	COVER, electronics, assembly, 25N519 (vertical)	1	
3a	26C545	BOARD, communication	1	1
3b	125856	SCREW, 8-32, flange head	4	4
3c	116343	SCREW, ground	4	4
4	17X343	COVER, motor	1	1
5*	-----	SUPPORT, rotor	1	1
6*	-----	SPRING, disc	1	1
8*	-----	ADJUSTER, rotor	1	1
9	15F931	RING, lift, sst 1 9/16 thread	1	1
10†	-----	GEAR, assembly, second stage	1	1
11†	-----	GEAR, assembly, first stage, tapered	1	1
13★✓	15H525	CAP, fill	1	1
14★✓	24E315	SIGHTGLASS	1	1
15★✓	-----	ADJUSTER, bearing, second stage	1	1
16	107100	SCREW, cap, socket head	4	4
17‡	-----	BEARING, rack	1	1
18‡	-----	RACK, assembly	1	1
19◆	-----	BEARING, shaft, assembly	1	1
21❖	-----	ENCODER,	1	1
21a❖*	-----	ENCODER, set screws	2	2
21b❖	-----	ENCODER, cable	1	1
22❖	-----	SCREW, machined, pan head, 4x.25	2	2
23†★✓	-----	GASKET, housing, gear	1	1
24+	109114	SCREW, cap, socket head	24	24
25	121319	FITTING, adapter, npt x jic	1	1
26†	25C182	SEAL, input shaft	1	1
28*	-----	ROTOR	1	1
29	24W120	SENSOR, stroke position	1	1
31◆	25C163	BUMPER, lower	1	1

Ref.	Part	Description	Qty.	
			25N519	25N520
32◆	25C162	WASHER, support	1	1
33▲★✓	17Y723	LABEL, safety, warning, horizontal		1
	17J476	LABEL, safety, warning, vertical	1	
37†★✓	-----	PACKING, o-ring	1	1
43‡	104572	WASHER, lock spring	24	24
44★✓	-----	ADJUSTER, 1st stage roller bearing	1	1
45†★✓	-----	PACKING, o-ring	1	1
46★✓	-----	NUT, jam	2	2
56	124165	SCREW, button head, m5-0.8x10, ss	3	4
61	108860	SCREW, machined, pan head, phillips	1	1
92	108788	WASHER, flat	4	4
93	26B025	COVER, fan, 24 Vdc, assembly, silver	1	1
96	127721	KNOB, impact, preventer	1	1
97	127463	SCREW, cap, socket head	1	1
112	C20987	PACKING, o-ring	1	1
114	126453	POWER SUPPLY, 24 V	1	1
115	-----	SCREW, machined, #8-32 x 0.375	2	2
116	130685	BRACKET, 24 V supply, APD motor	1	1
117✖	-----	HARNESS, power supply, 24 V, APD	1	1
119✖	-----	HARNESS, power supply, 240 V, APD	1	1
120	120112	FITTING, cap nut, -8 JIC	1	1
122✓	-----	FITTING, street elbow, 3/4 npt		1
124✓	-----	FITTING, elbow, street		1

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

\* Parts included in Rotor Kit 26C547 (purchase separately).

† Parts included in Gear Kit 26A398 (purchase separately).

‡ Parts included in Output Shaft Kit 26A399 (purchase separately).

◆ Parts included in Shaft Cartridge Kit 25C164 (purchase separately).

❖ Parts included in Encoder Kit 24U938 (purchase separately).

✱ Parts included in Encoder Fastener Kit 2008772 (purchase separately).

‡ Parts included in Bolt Kit 26A537 as pack of 10 (purchase separately).

✖ Parts included in Harness Kit 18A109 (purchase separately).

★ Parts included in Gear Cover Kit 26C566 (for E-Flo SP vertical driver). Purchase separately.

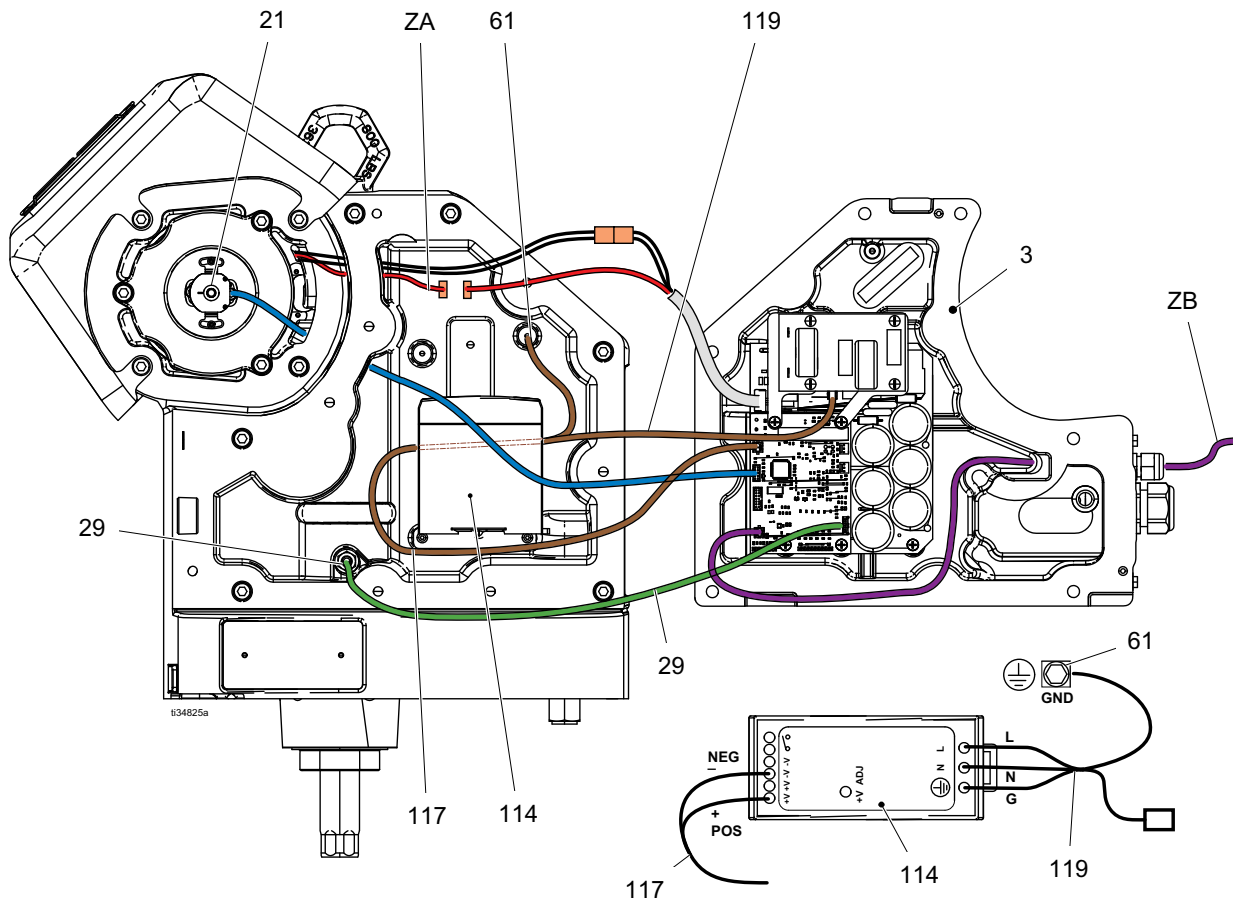
✓ Parts included in Gear Cover Kit 26C567 (for EFR proportioner horizontal driver). Purchase separately.

**NOTE:** The driver gear box is pre-filled with oil. Additional silicone-free, ISO 220-compliant, synthetic gear oil included in 16W645 (purchase separately).

## Repair Kits and Accessories

Motor Part No.	Description	Kits	Kit Description
All motors in this manual	APD20 Drivers	26A398	Gear kit
		26A399	Output shaft kit
		25C164	Shaft cartridge kit
		26C547	Motor rotor kit
		24U938	Motor encoder kit
		2008772	Motor encoder fastener kit
		26A537	Bolt kit
		18A109	Power supply harness kit
		26B025	Fan assembly
		26C545	Communication board
25N519	Vertical Driver for E-Flo SP	26B023	Electronics cover for E-Flo SP
		26C566	Gear box cover for E-Flo SP
25N520	Horizontal Driver for EFR Proportioner	26B024	Electronics cover for EFR Proportioner
		25C567	Gear box cover for EFR Proportioner

# Wiring Diagram



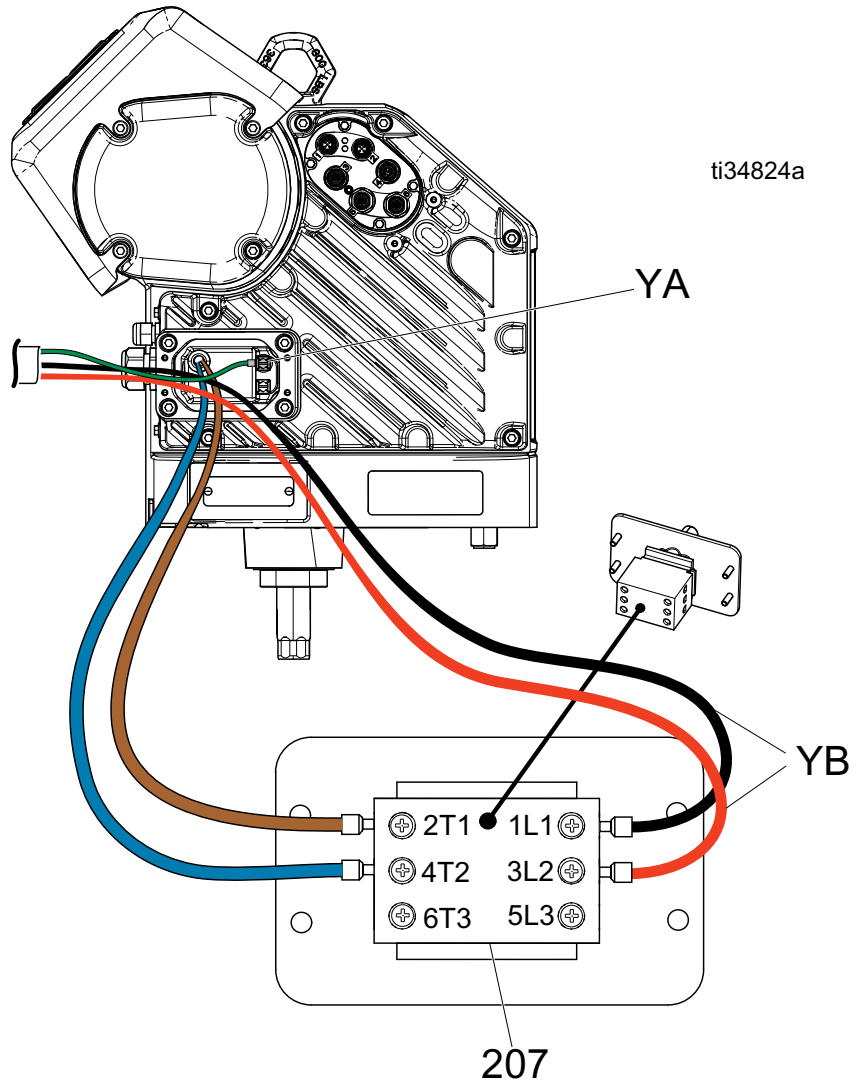
**FIG. 34: Electric Driver Internal Wiring**

Ref.	Part	Description
3	26B023	Electronics cover, vertical
	26B024	Electronics cover, horizontal
21*	-----	Motor encoder (includes harness)
29	24W120	Stroke position sensor (includes harness)
61	108860	Power supply ground screw
114	126453	24 V power supply
117†	-----	Harness, power supply, 24 V DC
119†	-----	Harness, power supply, 240 VAC
ZA	-----	Harness, motor leads
ZB‡	17E597	Fan cable

\* Parts included in Encoder Kit 24U938 (purchase separately).

† Parts included in Harness Kit 18A109 (purchase separately).

‡ Part pre-assembled with electronics cover.



**FIG. 35: Incoming Power Connections**

Ref.	Description
YA	Ground connection
YB	Power connections
207	Disconnect switch



# Mounting Hole Pattern

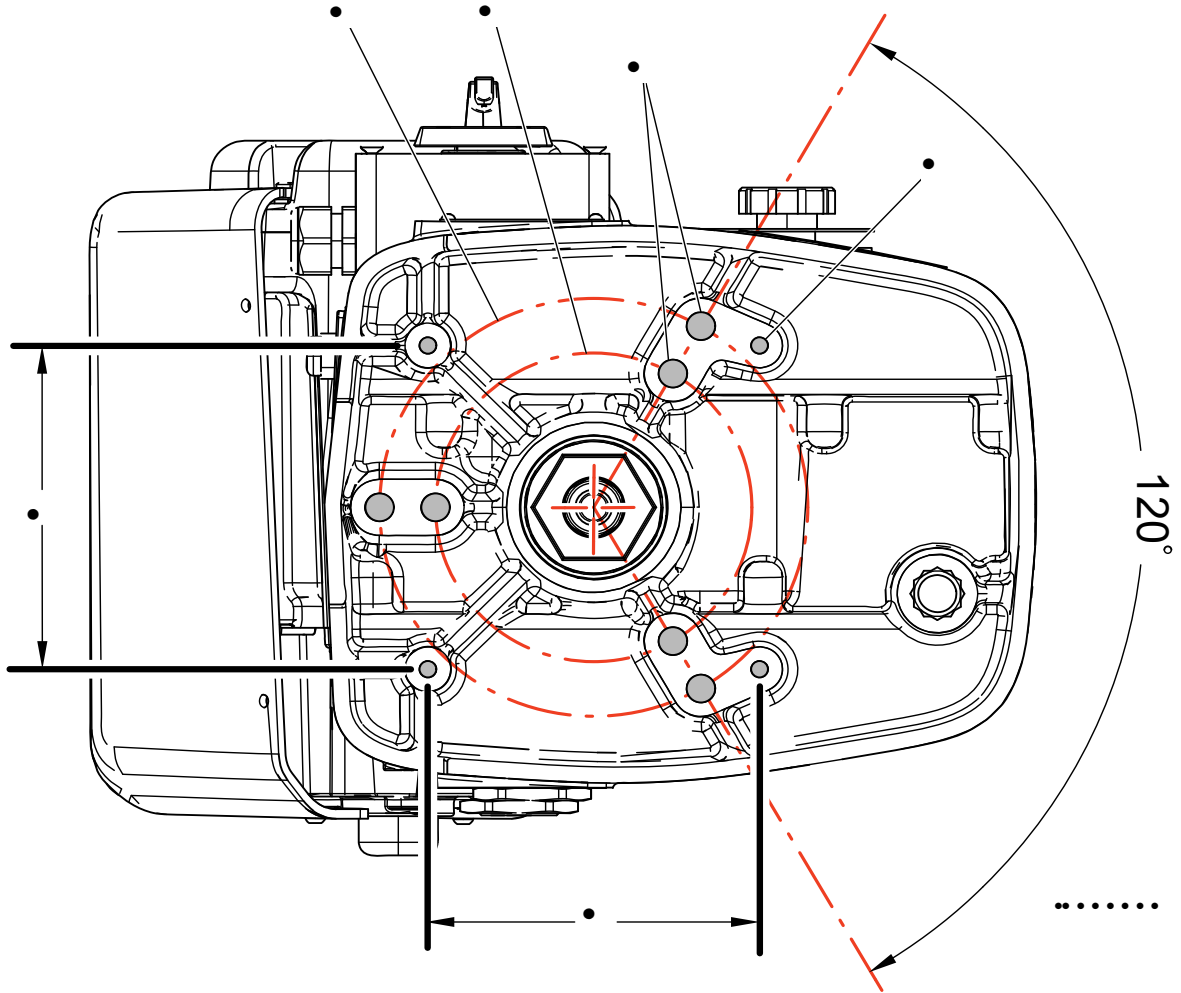
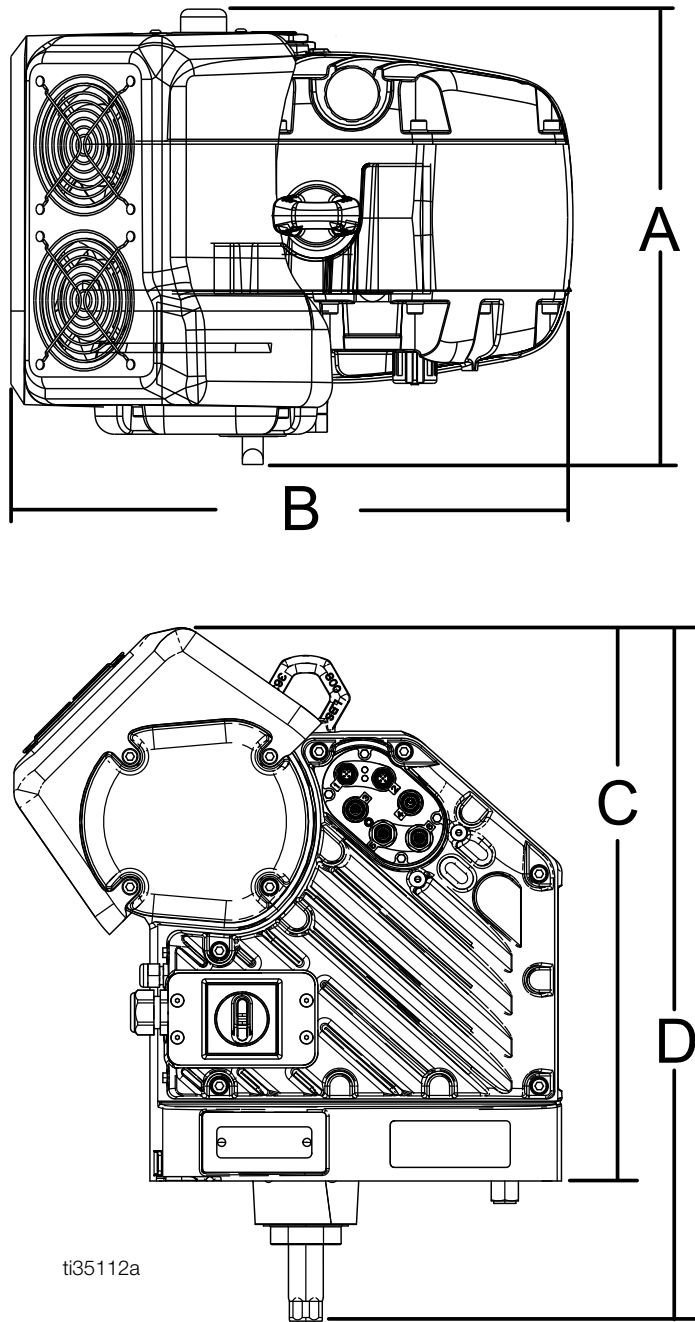


FIG. 36: Mounting Hole Pattern

Mounting Hole	Dimensions
A	6.2 in. (157 mm)
B	6.2 in. (157 mm)
C	Four 3/8-16 mounting holes
D	5/8-11 tie rod holes
E	5.9 in. (150 mm) bolt circle
F	8.0 in. (203 mm) bolt circle

# Dimensions



**FIG. 37: Dimensions**

<b>Driver Dimensions</b>	
A (width)	14.9 in (0.378 m)
B (depth)	18.3 in. (0.465 m)
C (mounted height)	18.3 in. (0.465 m)
D (total height, as shipped)	21.5 in. (0.545 m)

# Technical Specifications

<b>APD20 Advanced Precision Driver</b>		
	<b>US</b>	<b>Metric</b>
Driver force	3872 lbs	1756 kg
Stroke length	4.75 in.	120.65 mm
Maximum fluid operating temperature	180°F	82.3°C
Driver Line voltage rating	200-240 VAC, single phase, 50/60 HZ Transformer option available (400-480 VAC)	
Ambient operating temperature range (supply system)	32-100°F	0-38°C
Motor cutback threshold	212°F	100°C
IGBT/Electronics cutback threshold	167°F	75°C
Oil specification	Graco Part No. 16W645 ISO 220 silicone-free synthetic EP gear oil*	
<b>Full load amperage</b>		
240V systems	20 A	
400V systems	35 A	
480V systems	10 A	
<b>Maximum continuous cycle rate</b>		
Maximum continuous cycle rate	25 cycles per minute	
<i>To prevent premature pump wear, do not exceed the maximum recommended speed of the fluid pump.</i>		
<b>Oil capacity*</b>		
Vertical model (25N519)	1.5 quarts	1.4 L
Horizontal model (25N520)	2.2 quarts	2.1 L
<b>Weight</b>		
All models	115 lb	52 kg
<b>Notes</b>		
* <i>The driver gear box is shipped from the factory pre-filled with oil. Additional oil must be purchased separately.</i>		
All trademarks or registered trademarks are the property of their respective owners.		

## California Proposition 65

### CALIFORNIA RESIDENTS

 **WARNING:** Cancer and reproductive harm – [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov).

# 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.

## **FOR GRACO CANADA CUSTOMERS**

The Parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés, à la suite de ou en rapport, directement ou indirectement, avec les procédures concernées.

# Graco Information

For the latest information about Graco products, visit [www.graco.com](http://www.graco.com).

For patent information, see [www.graco.com/patents](http://www.graco.com/patents).

**TO PLACE AN ORDER**, contact your Graco distributor or call to identify the nearest distributor.

**Toll Free Phone Number:** 1-800-328-0211

*All written and visual data contained in this document reflects the latest product information available at the time of publication.  
Graco reserves the right to make changes at any time without notice.*

Original instructions. This manual contains English. MM 3A6482

**Graco Headquarters:** Minneapolis

**International Offices:** Belgium, China, Japan, Korea

**GRACO INC. AND SUBSIDIARIES • P.O. BOX 1441 • MINNEAPOLIS MN 55440-1441 • USA**  
**Copyright 2021, Graco Inc. All Graco manufacturing locations are registered to ISO 9001.**

[www.graco.com](http://www.graco.com)  
Revision E, March 2025