

## E70/E60 King<sup>®</sup> Electric Driver

3A8478A

EN

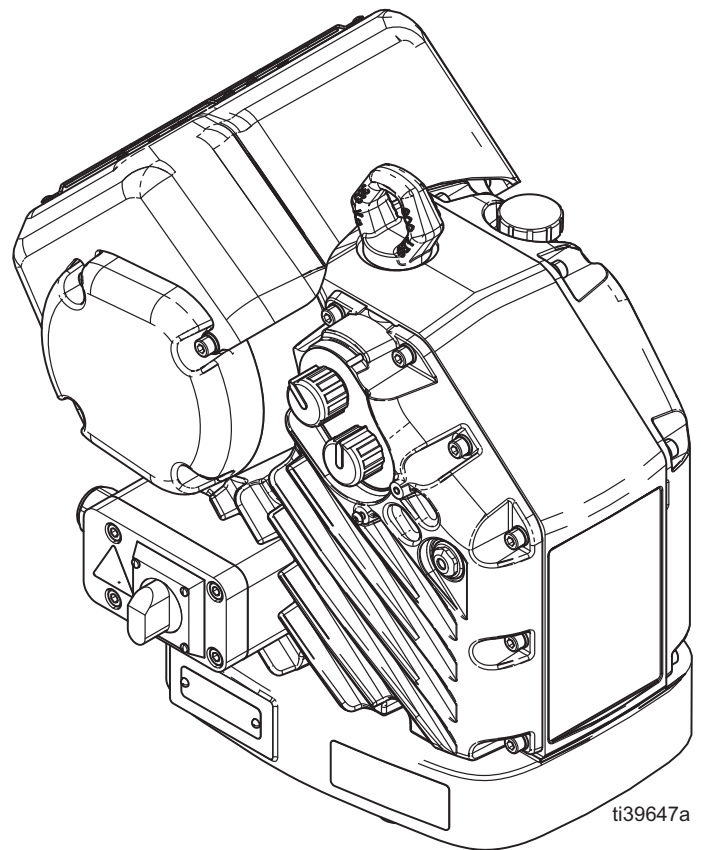
*Electric driver for application of protective coatings. For professional use only.  
Not approved for use in explosive atmospheres or hazardous (classified) locations.*



### Important Safety Instructions

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

**Model 25P291**



# Contents

<b>Related Manuals</b> .....	<b>2</b>	<b>Repair</b> .....	<b>14</b>
<b>Models</b> .....	<b>2</b>	Replace Output Seal Cartridge .....	14
<b>Warnings</b> .....	<b>3</b>	Replace Fan Fuses .....	14
<b>Component Identification</b> .....	<b>6</b>	Remove Fan Shroud .....	15
<b>Installation</b> .....	<b>7</b>	Disconnect Fan Wires .....	15
Power Requirements .....	7	Reinstall Fan Wires .....	16
Connect Power .....	7	Replace Electronics Cover .....	16
Grounding .....	8	Replace Stroke Position Sensor .....	19
Install Vented Oil Cap Before Using Equipment ..	8	Replace Encoder .....	20
<b>Operation</b> .....	<b>9</b>	Repair Token Cable .....	22
Startup .....	9	Software Update Procedure .....	23
Shutdown .....	9	<b>Parts</b> .....	<b>24</b>
Pressure Relief Procedure .....	10	Electric Driver .....	24
Driver Operation .....	10	Parts List - Electric Driver (25P291) .....	25
<b>Maintenance</b> .....	<b>11</b>	Mounting Hole Pattern .....	26
Preventative Maintenance Schedule .....	11	<b>Wiring Diagrams</b> .....	<b>27</b>
Change the Oil .....	11	<b>Dimensions</b> .....	<b>28</b>
Check Oil Level .....	11	<b>Technical Specifications</b> .....	<b>29</b>
Bearing Pre-Load .....	11	<b>California Proposition 65</b> .....	<b>29</b>
<b>Troubleshooting</b> .....	<b>12</b>	<b>Recycling and Disposal</b> .....	<b>29</b>
Error Code Troubleshooting .....	12	End of Product Life .....	29
Standby Mode .....	12	<b>Graco Extended Warranty</b> .....	<b>30</b>
Error Codes Table .....	12		

## Related Manuals

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









Manual in English	Description
3A8477	E70/E60 King Sprayer Manual

## Models









Part	Series	Description
25P291	B	King Driver, Non-Haz Loc

# 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 cord before servicing equipment.</li> <li>• Connect only to grounded electrical outlets.</li> <li>• Use only 3-wire extension cords.</li> <li>• Ensure ground prongs are intact on power and extension cords.</li> <li>• Do not expose to rain. Store indoors.</li> <li>• Wait five minutes after disconnecting power cord before servicing.</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>
	<p><b>BURN HAZARD</b></p> <p>Equipment surfaces and fluid that is heated can become very hot during operation. To avoid severe burns:</p> <ul style="list-style-type: none"> <li>• Do not touch hot fluid or equipment.</li> </ul>

# **WARNING**

 	<p><b>MOVING PARTS HAZARD</b></p> <p>Moving parts can pinch, cut or amputate fingers and other body parts.</p> <ul style="list-style-type: none"> <li>• Keep clear of moving parts.</li> <li>• Do not operate equipment with protective guards or covers removed.</li> <li>• Equipment can start without warning. Before checking, moving, or servicing equipment, follow the <b>Pressure Relief Procedure</b> and disconnect all power sources.</li> </ul>
    	<p><b>SKIN INJECTION HAZARD</b></p> <p>High-pressure fluid from gun, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. <b>Get immediate surgical treatment.</b></p> <ul style="list-style-type: none"> <li>• Do not spray without tip guard and trigger guard installed.</li> <li>• Engage trigger lock when not spraying.</li> <li>• Do not point gun at anyone or at any part of the body.</li> <li>• Do not put your hand over the spray tip.</li> <li>• Do not stop or deflect leaks with your hand, body, glove, or rag.</li> <li>• Follow the <b>Pressure Relief Procedure</b> when you stop spraying and before cleaning, checking, or servicing equipment.</li> <li>• Tighten all fluid connections before operating the equipment.</li> <li>• Check hoses and couplings daily. Replace worn or damaged parts immediately.</li> </ul>
	<p><b>TOXIC FLUID OR FUMES HAZARD</b></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"> <li>• Read Safety Data Sheets (SDSs) to know the specific hazards of the fluids you are using.</li> <li>• Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.</li> </ul>

# ! WARNING



## 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.



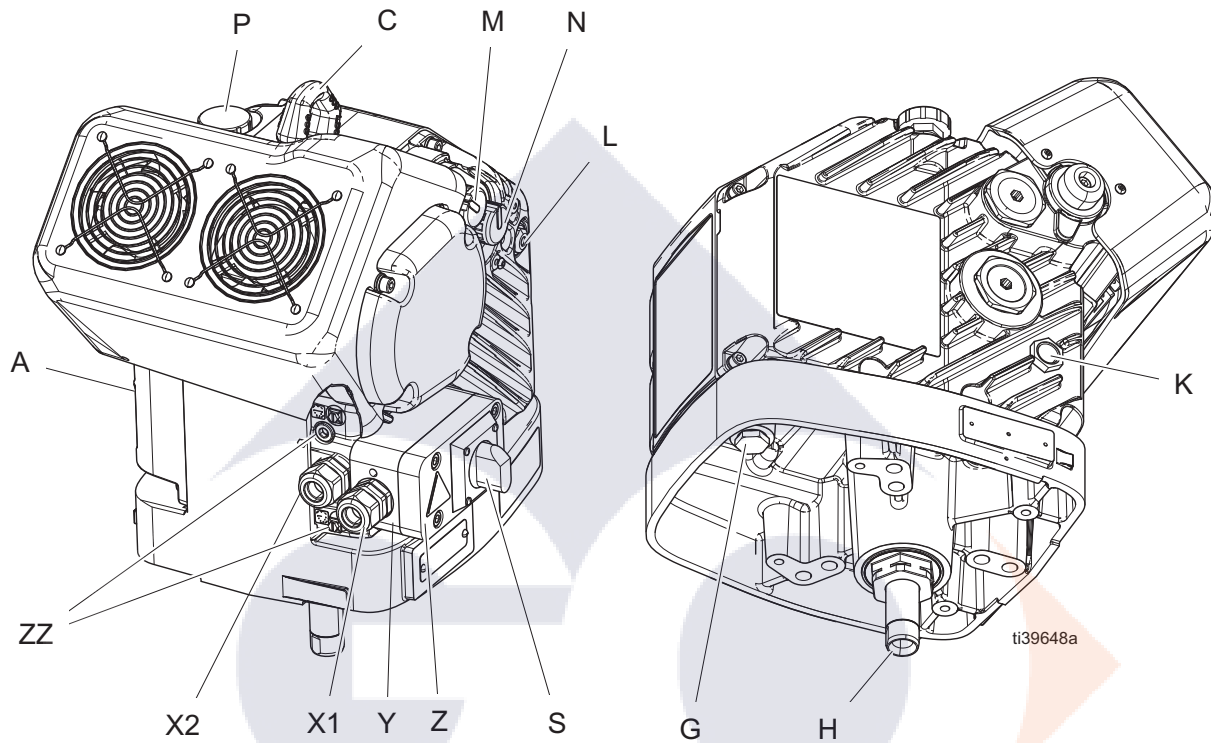
## EQUIPMENT MISUSE HAZARD

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.

# Component Identification





Ref.	Description
A	Driver
C	Lift Ring
G	Oil Drain Plug
H	Driver Output Shaft
K	Oil Sight Glass
L	Status Indicator Light (LED)
M	Mode Selector Knob
N	Pressure Control Knob

Ref.	Description
*P	Oil Fill Cap (vented)
S	Power Switch (Lock-out tag-out equipped)
Y	Electrical Junction Box
Z	Electrical Junction Box Cover
ZZ	Ground Screws
X1	Cord Grip (for Power Cord)
X2	Cord Grip (for Fan Cable)

\* The driver is pre-filled with oil from the factory. The temporary unvented cap is for shipping purposes only and must be replaced with the supplied vented cap before use.

# Installation

				
<p>Improper wiring may cause electric shock or other serious injury. All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</p>				

## Power Requirements

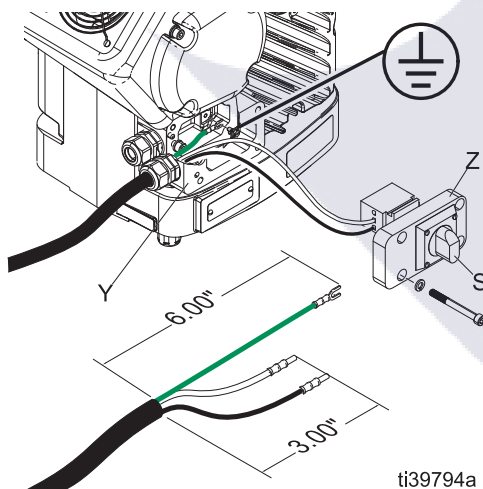
See **Table 1** for power source requirements. The system requires a dedicated circuit protected with a circuit breaker.

**Table 1: Power Source Specifications**

Voltage	Phase	Hz	Current
200-240 VAC	1	50/60	20 A
100-120 VAC	1	50/60	30 A

## Connect Power

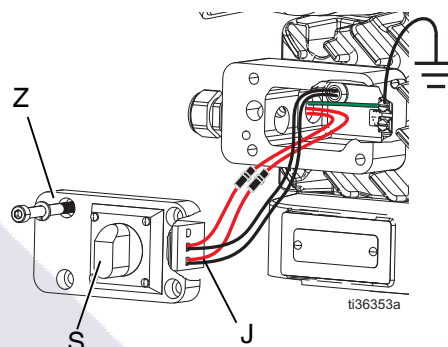
- Cut power cord wires to the following lengths:
  - Ground wire - 6.5 inches (16.5 cm)
  - Power wires - 3.0 inches (7.6 cm)
  - Add ferrules as necessary. See **FIG. 1**.



**FIG. 1: Power Cord**

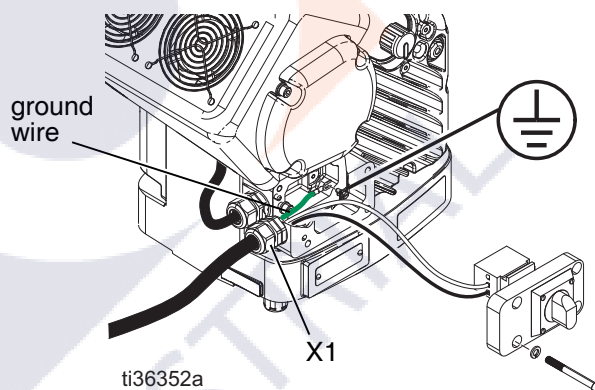
- Bring cord to unit and remove four screws to separate junction box cover (Z) with power switch (S) from junction box (Y). See **FIG. 1**.
- With junction box cover (Z) and power switch (S) detached from machine, wires inside junction will appear as below.

**NOTE:** The two fan harness wires will be installed in disconnect block (J) in both 1L1 and 3L2 terminals.



**FIG. 2: Grounding Wire**

- Insert power cord (from step 1) through cord grip (X1) and into junction box (Y). Attach the power cord ground wire to the lower ground terminal inside junction box (Y).



**FIG. 3: Junction Box Connections**

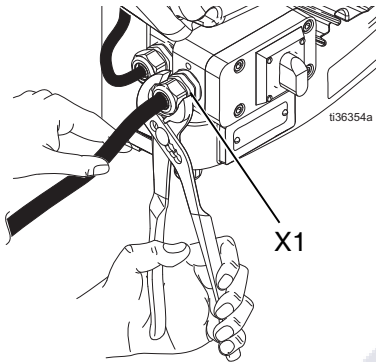
- Power wires should be installed into 2T1 and 4T2 terminals. See **Wiring Diagrams** on page 27.

**NOTE:** The upper ground screw is used by the fan wire harness and should not be used for both connections.

- Place fan wires and other power wires into open area on either side of disconnect block (J) as space permits. Reinstall junction box cover (Z).

<b>NOTICE</b>
<p>If wires get pinched when the screws are tightened, damage will occur. Make sure all wires are routed correctly before installation.</p>

- Replace junction box screws and washers removed in step 2 and tighten cord grip (X1) to securely hold power cord in junction box (Y). See FIG. 4.



**FIG. 4: Junction Box Screws and Strain Relief Cord Grip**

## Grounding

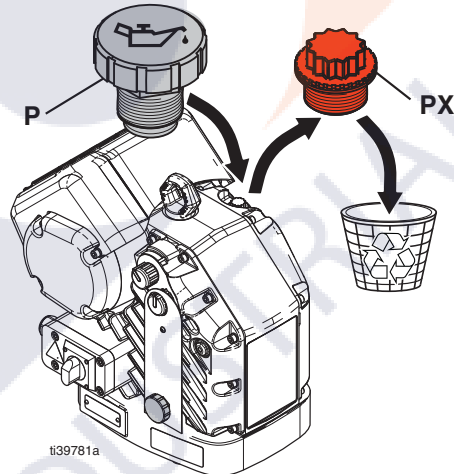


The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.

**Driver:** The driver is grounded through the power cord. See **Connect Power**, page 7.

## Install Vented Oil Cap Before Using Equipment

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



**FIG. 5: Unvented and Vented Oil Caps**



# Operation



## Startup

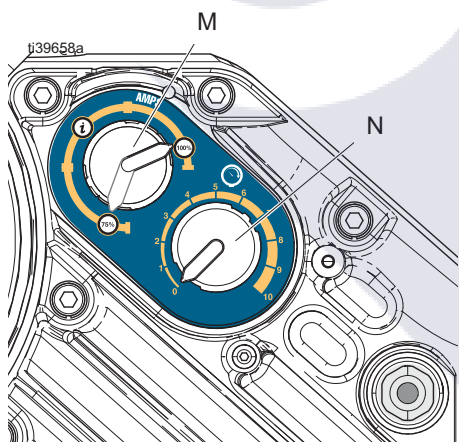
1. Perform **Installation** procedures starting on page 7.
2. Turn the pressure control knob (N) fully counterclockwise to 0.
3. Connect the power cord to a power source.
4. Pull mode selector knob (M) out and set it to the desired mode:
  - 100% Power (High Amp) Mode\*
  - 75% Power (Low Amp) Mode\*\*

Push in the knob to lock.

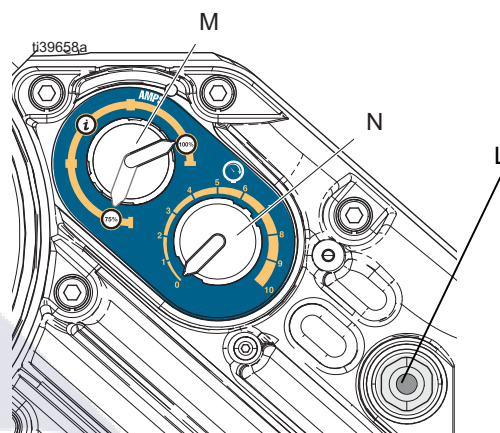
\* See **Technical Specifications**, page 29, for input power information.

\*\* Reduces current draw to:

- 15A for 200-240 V operation, or
- 20A for 100-120 V operation



5. Turn the power switch (S) ON.
6. Check that the status indicator (L) is on and not flashing.



**FIG. 6: Status Indicator Light**

## Shutdown



To shut down the system, perform the **Pressure Relief Procedure** on page 10.

## 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 and moving parts, follow the Pressure Relief Procedure when you stop spraying and before cleaning, checking, or servicing the equipment.

1. Pull pressure control knob (N) out and turn counterclockwise until it stops. Push the knob in to lock.
2. Turn power switch (S) OFF.
3. Disconnect the power cord from the power source.
4. Relieve all fluid pressure as explained in your separate system manual. See **Related Manuals**, page 2.

## Driver Operation

### Pressure Control

The driver will adjust the speed to maintain a constant fluid pressure.

1. Pull the pressure control knob (N) out to set.
2. Turn the knob clockwise to increase the pressure, or counter-clockwise to decrease the pressure. Push the knob to lock.

# Maintenance

## NOTICE

Do not open/remove 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.

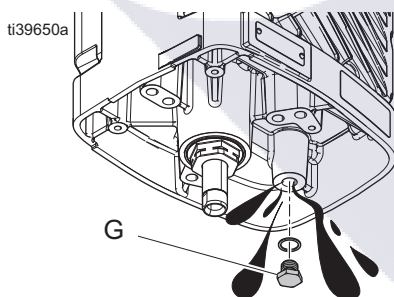
## Preventative Maintenance Schedule

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.

## 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 liter) container under the oil drain port. Remove the oil drain plug (G). Allow all oil to drain from the driver.



**FIG. 7: Oil Drain Plug**

2. Reinstall the oil drain plug (G). Torque to 18-23 ft-lb (25-30 N•m).

## NOTICE

Do not over-torque. The drain plug can become stripped and damaged.

3. Open the oil fill cap (P) and add Graco Part 16W645 ISO 220 silicone-free synthetic EP gear oil. Check the oil level in the sight glass (K). (See FIG. 8.) Fill until the oil level is near the halfway point of the sight glass. The oil capacity is approximately 1.0 - 1.2 quarts (0.9 - 1.1 liters). **Do not overfill.**

## NOTICE

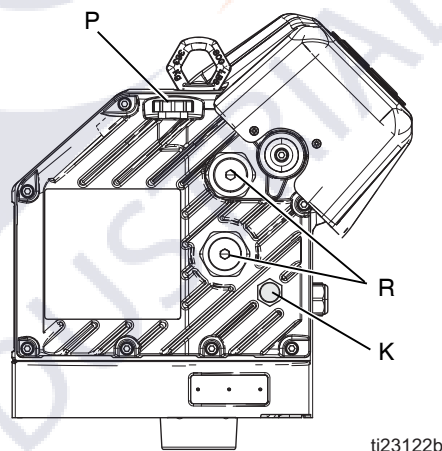
Only use oil with Graco part number 16W645. Any other oil may not lubricate properly and can cause damage to the drive train.

4. Reinstall the oil fill cap (P).

## Check Oil Level

Check the oil level in sight glass (K). (See FIG. 8.) The oil level should be near the halfway point of the sight glass when the driver is not running. If oil is low, open oil fill cap (P) and add Graco Part No. 16W645 ISO 220 silicone-free synthetic EP gear oil. See FIG. 8.

The oil capacity is approximately 1.0 - 1.2 quarts (0.9 - 1.1 liters). **Do not overfill.**

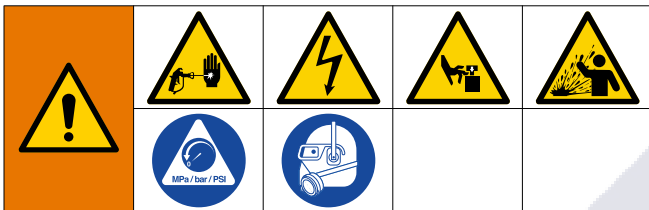


**FIG. 8: Sight Glass and Oil Fill Cap**

## Bearing Pre-Load

See FIG. 8. The bearing pre-loads (R) are factory set and are not user adjustable. Do not adjust the bearing pre-loads.

# Troubleshooting



**NOTE:** To clear an error code, cycle power by turning the power switch (S) to the OFF position for at least 30 seconds before turning back ON.

## Error Code Troubleshooting

Error codes can take two forms:

- Alarm: Alerts you to the cause of the alarm and shuts down the driver.
- Deviation: Alerts you to the problem, but the driver may continue to run past the set limits until the system absolute limits are reached.

**NOTE:** The blink code is displayed using the status indicator (L) on the driver. The blink code given below indicates the sequence. For example, blink code 2 indicates two blinks, a pause, and then repeats.

## Standby Mode

When slow blinking is displayed, the driver has entered Standby Mode. When the driver is on and pressurized but the pump has not moved any material, the driver will enter Standby Mode.

Standby Mode will be exited when:

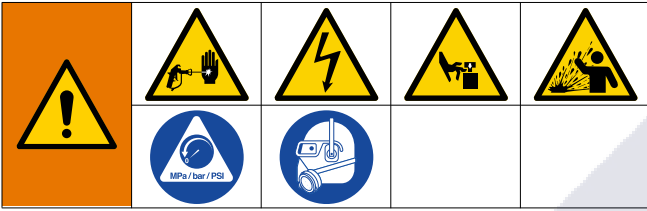
- Material starts to dispense and causes the pump to move, OR
- The pressure control knob (N) is adjusted, OR
- The power switch (S) is cycled OFF and ON

## Error Codes Table

Blink Code	Error Type	Troubleshooting Steps
1	Alarm	<p><b>Pump Diving</b> The pump is diving rapidly. A pressure imbalance between the up and down stroke of the pump is causing the pump to dive with excessive speed.</p> <ul style="list-style-type: none"> <li>• Pump diving may occur when the pump runs out material while spraying at high pressure.</li> <li>• Verify that material is being properly fed to the pump.</li> <li>• Pressure from the hose could flow back into the pump on the down stroke.</li> <li>• Verify that the check valve is installed and is properly working.</li> </ul>
2	Alarm	<p><b>Voltage Too Low</b></p> <ul style="list-style-type: none"> <li>• Verify that line voltage is within the range specified in <b>Technical Specifications</b>, page 29.</li> <li>• Cycle power and check status indicator (L) to see if the error is still active.</li> </ul>
3	Alarm	<p><b>Voltage Too High</b></p> <ul style="list-style-type: none"> <li>• Verify that line voltage is within the range specified in <b>Technical Specifications</b>, page 29.</li> <li>• Cycle power and check status indicator (L) to see if the error is still active.</li> </ul>

Blink Code	Error Type	Troubleshooting Steps
4	Deviation	<p><b>High Temperature</b> The temperature of the system is near the maximum operation temperature. The performance has been reduced to prevent the driver from completely shutting down.</p> <ul style="list-style-type: none"> <li>• Check fan operation. Clean the fan and driver housing.</li> <li>• Reduce pressure, duty cycle, or gun tip size.</li> <li>• Move the unit to a cooler location.</li> </ul>
5	Deviation	<p><b>Low Temperature</b></p> <ul style="list-style-type: none"> <li>• Warm equipment.</li> <li>• Circuit board cannot read motor temperature sensor. Check if the sensor is plugged into the correct connector.</li> </ul>
6	Alarm	<p><b>Motor Temperature Fault</b> Motor is running too hot. Allow unit to cool.</p> <ul style="list-style-type: none"> <li>• Check fan operation. Clean overspray buildup from the fan and driver housing.</li> <li>• Reduce pressure, duty cycle, or gun tip size.</li> <li>• Move the unit to a cooler location.</li> </ul>
7	Alarm	<p><b>Board Temperature Fault</b> The control board is running too hot. Allow the unit to cool.</p> <ul style="list-style-type: none"> <li>• Check fan operation. Clean overspray buildup from the fan and driver housing.</li> <li>• Reduce pressure, duty cycle, or gun tip size.</li> <li>• Move the unit to a cooler location.</li> </ul>
8	Alarm	<p><b>Encoder Calibration Error</b></p> <ul style="list-style-type: none"> <li>• Cycle power and check status indicator (L) to see if the error is still active.</li> <li>• Calibrate the encoder (this code will blink if calibration is in progress).</li> </ul>
9	Alarm	<p><b>Encoder Error</b></p> <ul style="list-style-type: none"> <li>• Cycle power and check the status indicator (L) to see if the error is still active.</li> <li>• Verify that the encoder cable (D) is connected securely (see <b>Wiring Diagrams</b>, page 27).</li> <li>• The encoder may need replacement.</li> </ul>
10	Alarm	<p><b>Software Versions Do Not Match</b></p> <ul style="list-style-type: none"> <li>• See your system manual, <b>Related Manuals</b>, page 2. for software token part number.</li> <li>• Obtain software update token and follow <b>Software Update Procedure</b>, page 23.</li> </ul>
11	Alarm	<p><b>Circuit Board Communication Failure</b> Cycle power and check status indicator (L) to see if the error is still active.</p>
12	Alarm	<p><b>Internal Circuit Board Hardware Failure</b> Cycle power and check status indicator (L) to see if the error is still active.</p>
13, 14	Alarm	<p><b>Internal Software Error</b> Cycle power and check status indicator (L) to see if the error is still active.</p>
Slow Blink	Deviation	See <b>Standby Mode</b> , page 12.

# Repair



## Replace Output Seal Cartridge

1. Stop pump at the top of its stroke. Shut off and disconnect power to driver.
2. Follow the **Pressure Relief Procedure** on page 10.
3. Disconnect the lower from the driver. See your system manual, **Related Manuals**, page 2.
4. Drain oil from driver. See **Change the Oil**, page 11.
5. Reinstall oil drain plug (25). Torque to 18-23 ft-lb (25-30 N•m).

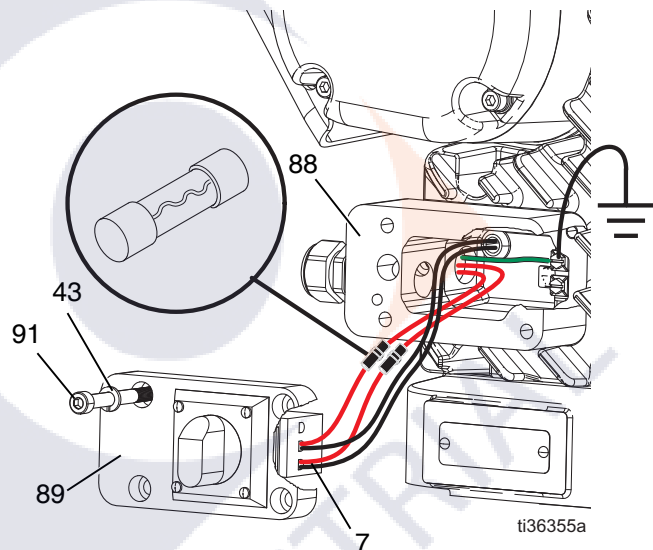
**NOTICE**

Do not over-torque. The drain plug can become stripped and damaged.

6. Unscrew seal cartridge assembly (19) from driver. See **Parts**, page 24.
7. Install new seal cartridge assembly (19). Torque to 175-200 ft-lb (240-280 N•m).
8. Fill with oil. See **Change the Oil**, page 11.
9. Reconnect lower to driver (see your system manual, See **Related Manuals**, page 2).

## Replace Fan Fuses

1. Follow the **Pressure Relief Procedure** on page 10.
2. Disconnect unit from power source.
3. Remove four screws (91) and remove junction box cover (89) from driver to gain access to the disconnect block (7). Gently pull out fuse holders.
4. Unscrew fuse holder, remove old fuse, and replace with new fuse (Graco part number 116682) (5 mm x 20 mm, 500 mA, 250V, Slow Blow). Reconnect fuse holder and tighten.



**FIG. 9: Fuse Location**

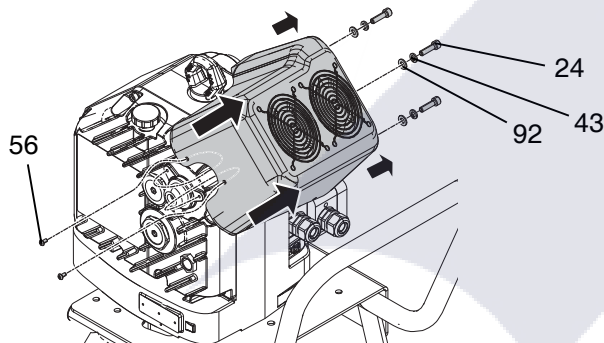
5. Repeat step 4 with second fuse.
6. Tuck wires back into junction box (88) and reinstall junction box cover (89) with four screws (91) and washers (43).

**NOTICE**

If wires get pinched when the screws are tightened, damage will occur. Make sure all wires are routed correctly before installation.

## Remove Fan Shroud

1. Disconnect the unit from the power source.
2. Remove screws (56, 24) that attach the fan assembly to driver and pull up on end farthest from junction box. Slide assembly toward the junction box to remove.



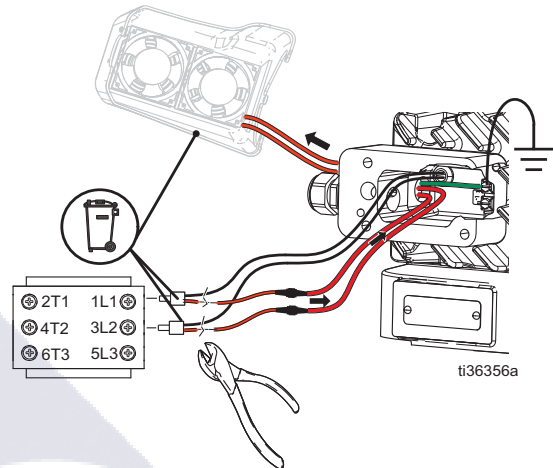
**FIG. 10: Fan Assembly Removal**

3. Attach the fan assembly
  - a. To reattach the fan assembly, slide cover into slots for tabs located on the junction box side of the driver and gently push down far end (see FIG. 10).
  - b. To install a new fan assembly, follow **Disconnect Fan Wires.**

## Disconnect Fan Wires

1. Follow the **Pressure Relief Procedure** on page 10.
2. Disconnect unit from power source.
3. Remove four screws (91) and remove junction box cover (89) from driver to gain access to the disconnect block (7). See FIG. 9.

4. Loosen terminal screws for 1L1 and 3L2 and gently remove wires from each location.

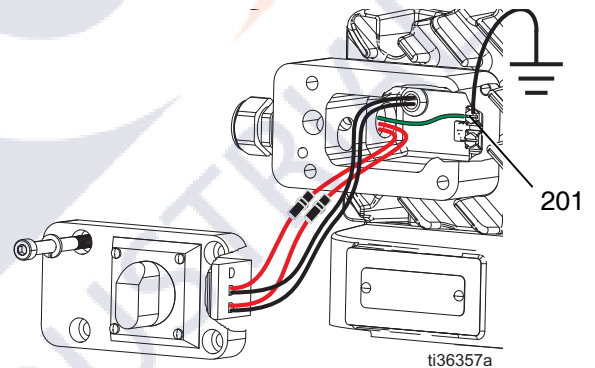


**FIG. 11: Remove Wires**

5. Use a wire cutter to cut ferrule tips from fan wires and motor power wires close to ferrules.

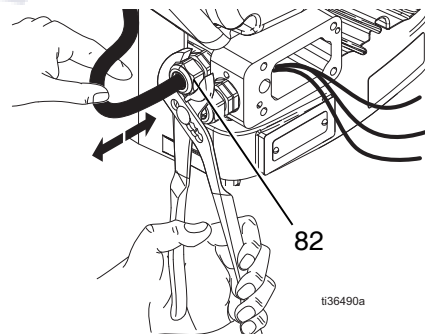
**NOTE:** Do not cut the tip off of the ground wire. See FIG. 11.

6. Remove the upper grounding screw (201) and disconnect green fan ground wire.



**FIG. 12: Fan Grounding Screw**

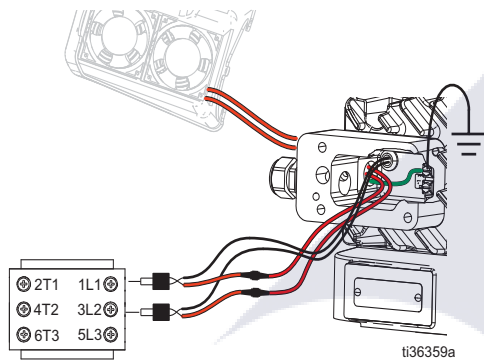
7. Loosen fan wire harness cord grip (82) attached to driver and pull out fan wire harness.



**FIG. 13: Remove Fan Wires**

## Reinstall Fan Wires

1. Route wires through fan cord grip (82) attached to driver (see FIG. 13 on page 15).
2. Reattach the ground wire to the upper grounding screw. Tighten ground screw. See FIG. 2 on page 7.



**FIG. 14: Attach Grounding Screw**

3. Use a ferrule to connect each fan wire to one of two wires coming out of the electronics cover (3) and crimp ferrule with a crimp tool. Then attach one wire set into the disconnect block (7) terminals 1L1 and the other wire into location 3L2. See FIG. 14 on page 16.
4. Tuck wires back into junction box (88) and reinstall junction box cover (89) with four screws (91).

### NOTICE

If wires get pinched when the screws are tightened, damage will occur. Make sure all wires are routed correctly before installation.

5. Tighten fan cord grip (82) (see FIG. 13 on page 15).

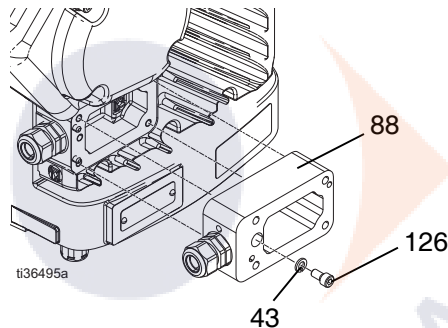
## Replace Electronics Cover

### Removal

1. Follow the **Pressure Relief Procedure** on page 10.
2. Disconnect unit from power source.
3. Remove the lower from the driver (see your system manual, **Related Manuals**, page 2).

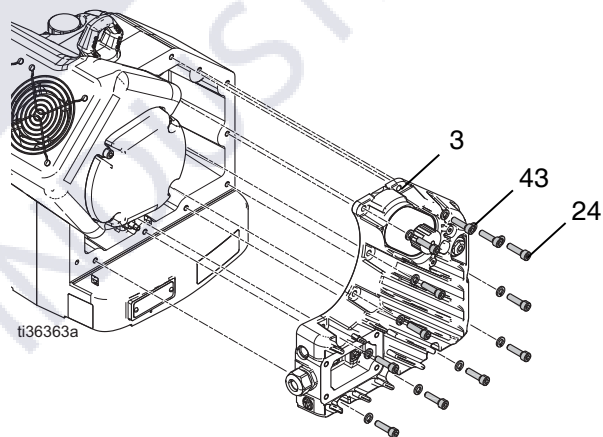
**NOTE:** This is required to complete the calibration procedure (page 17).

4. Follow **Remove Fan Shroud and Disconnect Fan Wires** on page 15.
5. Remove lower ground screw and power cord ground wire, then remove the box sleeve mounting screw (126) and box sleeve (88).



**FIG. 15: Junction Box Sleeve**

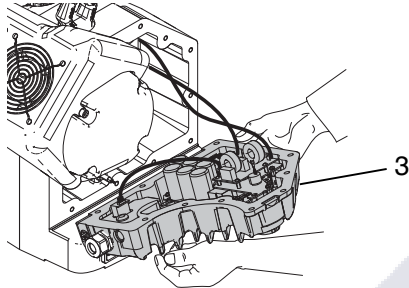
6. Remove 12 screws (24) and washers (43) from electronics cover (3).



**FIG. 16: Electronics Cover Removal**



- 7. Carefully separate the electronics cover (3) from the driver, then disconnect the wires.



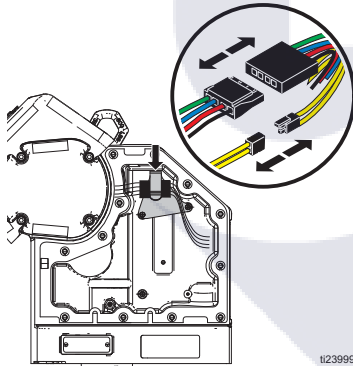
t123998a

**FIG. 17: Remove Electronics Cover**

**NOTICE**

All wires must be disconnected before the cover is completely removed. Hold the cover in place while disconnecting wires or let the cover rest on a work surface to avoid damaging the wires and connections.

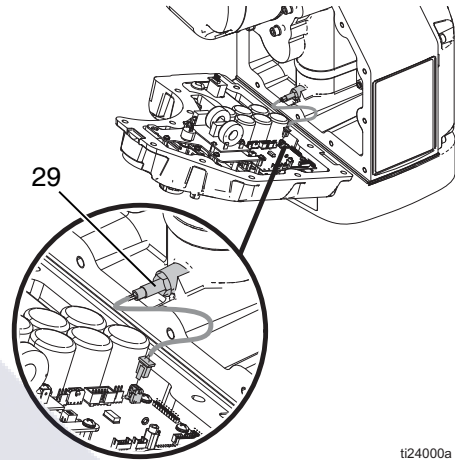
- 8. Pull wire connectors down, out of the harness clip and disconnect the motor power and motor temperature wires.



t123999a

**FIG. 18: Motor Wires**

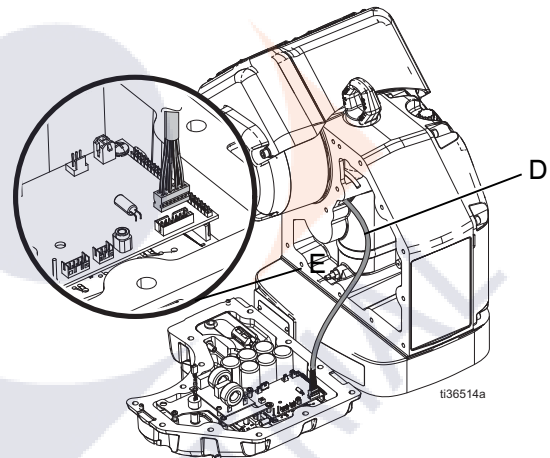
- 9. Disconnect the stroke position sensor (29).



t124000a

**FIG. 19: Stroke Position Sensor**

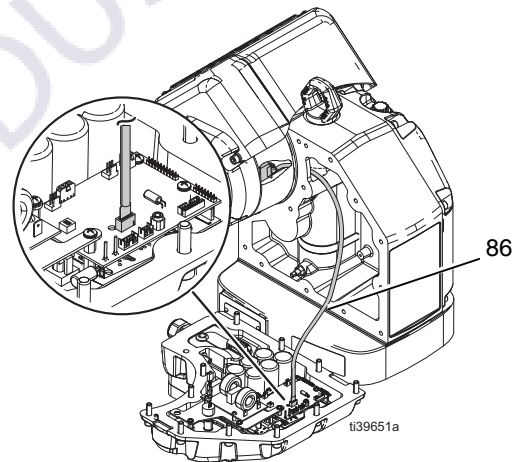
- 10. Disconnect encoder cable (D).



t136514a

**FIG. 20: Encoder Cable**

- 11. Disconnect the token cable (86).



t139651a

**FIG. 21: Token Cable**

## Installation

1. Reconnect all wires:
  - Motor power and motor temperature sensor. See FIG. 18 on page 17.
  - Token cable (86). See FIG. 21 on page 17.
  - Encoder cable (D). See FIG. 20 on page 17.
  - Stroke position sensor (29). See FIG. 19 on page 17.
2. Install electronics cover (3), 12 washers (43), 12 screws (24) and torque to 15-20 ft-lb (20-27 N•m). See FIG. 16, page 16.

### NOTICE

If wires get pinched when the cover screws are tightened, damage will occur. Make sure all wires are positioned inside the cover before installation.

3. Follow **Reinstall Fan Wires** on page 16.
4. Follow **Connect Power** on page 7.
5. Connect power cord to power source.

## Calibration

**NOTE:** The lower must be removed from the driver in order to calibrate the driver correctly. The calibration stroke length is longer than the operating stroke. Leaving the lower attached will cause the driver rod to contact the lower rod and it will not calibrate correctly.

1. Cycle power to the driver by first turning the power switch (S) to OFF, and then to ON again.
2. Wait for the status indicator LED (L) to turn on solid or start blinking.
3. Within 30 seconds, rapidly turn the pressure control knob (N) back and forth from 0 to 10 at least five times and then set the knob back to 0. If the status indicator LED (L) was solid before, it will begin blinking an encoder calibration error (code 8) during the calibration process.
  - The driver output shaft (H) will move up and down slowly over the course of several minutes.
  - Midway through the auto-calibration process, the driver output shaft (H) will pause as it moves to the next step.
  - The driver output shaft (H) will move up and down faster 5-6 times.
4. Ensure the auto-calibration process is complete before continuing. Wait for the LED to stop blinking.

## Reattach Pump Lower

See your system manual, **Related Manuals**, page 2

## Replace Stroke Position Sensor

### NOTICE

To avoid damage to the electronic components, wear grounding strap (Graco part 112190 - not supplied) and ground appropriately.

### Overview

The stroke position sensor is used to determine where the driver output shaft (H) is in the stroke.

### Tools Required

- 6 mm Hex Wrenches
- 13 mm Open-Ended Wrench
- 6 mm Open-Ended Wrench
- Phillips Screwdriver (#2)
- Torque Wrench (15 ft-lb, 20 N•m)

### Prepare Driver

1. Follow **Pressure Relief Procedure**, page 10.
2. Disconnect the unit from the power source.
3. Remove the pump lower from the driver per your system manual. See **Related Manuals**, page 2.

### Remove Electronics Cover

**NOTE:** Refer to FIG. 16, page 16.

### NOTICE

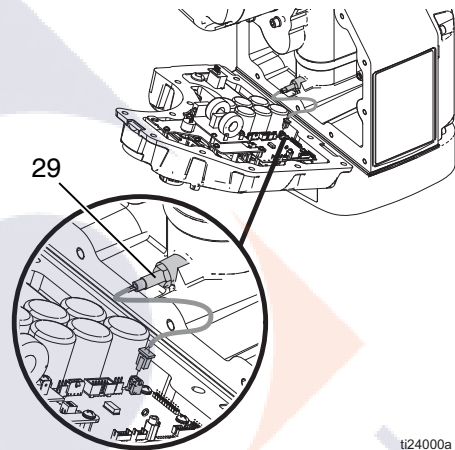
To avoid equipment damage, carefully support the cover when removing the last bolt. Hold the cover horizontally and take care that the wires are not pulled tight.

1. Remove the 12 screws (24) and washers (43) that hold on the electronics cover (3) using a 6 mm hex wrench. Place bolts in a safe location.
2. Pull the cover straight off of the alignment pins that hold the cover in place.
3. Support the cover after it has been removed to prevent putting excess strain on the wires inside.

## Remove Stroke Position Sensor

1. Unplug the stroke position sensor (29) from the control board (see **Wiring Diagrams**, page 27).
2. Loosen the stroke position sensor jam nut using a 13 mm wrench.
3. Unscrew the stroke position sensor (29) from the center housing using a 6 mm open ended wrench.

**NOTE:** Allow wires to rotate with position sensor to prevent twisting.



ti24000a

**FIG. 22: Remove Stroke Position Sensor**

## Install New Stroke Position Sensor

1. Carefully screw the replacement stroke position sensor into the center housing.
2. Use the 6 mm wrench to complete the installation of the stroke position sensor. Be careful not to use excessive torque. Stop once the position sensor bottoms out in the bore.

### NOTICE

Do not overtighten the stroke position sensor. Damage to the position sensor may result.

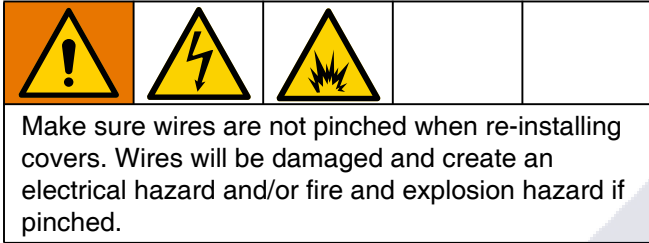
3. Tighten the jam nut on the stroke position sensor finger tight.

### NOTICE

Do not use a wrench to tighten the jam nut. Damage to the position sensor may result.

4. Plug the stroke position sensor into the control board (see **Wiring Diagrams**, page 27).

## Reinstall Electronics Cover onto Driver



1. Plug in all connectors. Ensure all connectors are securely attached to the control board. See **Wiring Diagrams**, page 27.
2. Secure loose motor wires into the clip inside the housing (see **Wiring Diagrams**, page 27).
3. Reinstall electronics cover (3) onto the center housing.
4. Install the 12 screws (24) and washers (43) using a 6 mm hex wrench. See FIG. 16, page 16.

**NOTE:** Ensure the lock washers are still in place.

5. Torque the screws to 15 ft-lb (20 N•m).

## Reattach Pump Lower

See your system manual, **Related Manuals**, page 2.

## Replace Encoder

### Overview

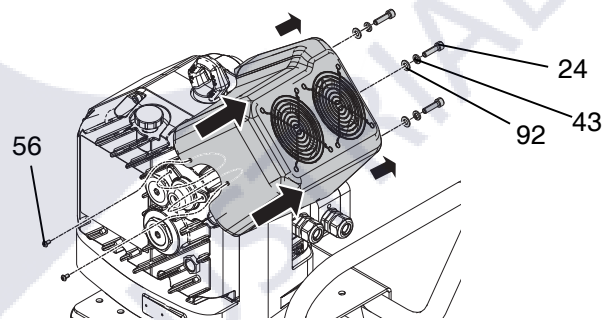
The encounter is used by the driver for two purposes. First, the encoder tells the control board where the motor is in its mechanical rotation and uses that information to properly control the motor torque.

Second, it controls stroke length by allowing the control board to count the number of complete motor rotations.

### Tools Required

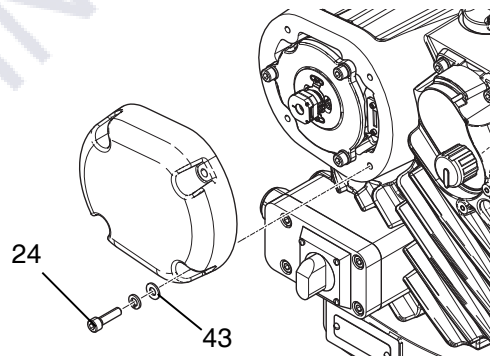
- 6 mm Hex Wrench
- 0.050 in Hex Wrench
- Phillips Screwdriver (#1)
- Torque Wrench (15 ft-lb, 20N•m)
- Blue (Medium) Thread Locking Compound

1. Follow the **Pressure Relief Procedure**, page 10.
2. Disconnect the unit from the power source.
3. Remove screws (56, 24) that attach the fan assembly to the driver and pull up on the end farthest from the junction box. Slide the assembly toward the junction box to remove.



**FIG. 23: Remove Fan**

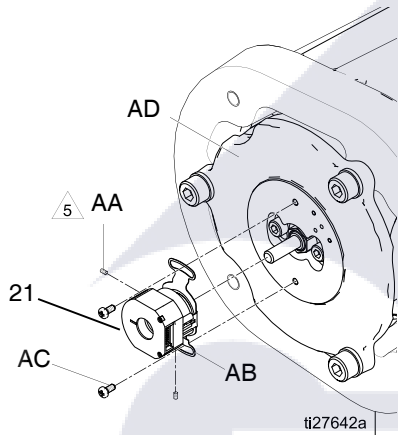
4. Use a 6 mm hex wrench to remove the last bolt (24) and washer (43) from the motor cover.



**FIG. 24: Remove Motor Cover**

### Remove Encoder

1. Loosen the two hub set screws (AA) using the included 0.050 in. hex wrench.
2. Remove the two mounting screws (AC) with a Phillips head screwdriver.
3. Pull the encoder (21) off of the rotor shaft.



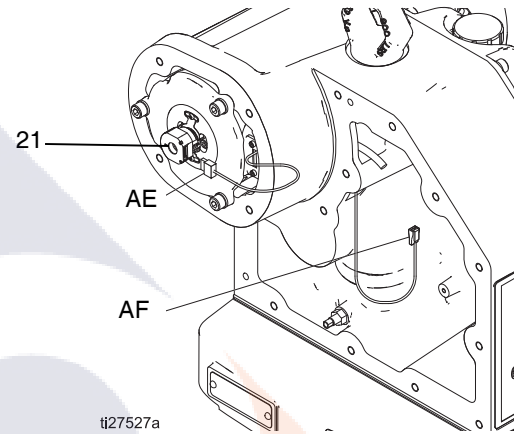
**FIG. 25: Remove Encoder**

Ref.	Description
AA	Set screws $\triangle 5$ 50 +/- 5 in.-oz (0.35 N•m)
AB	Encoder mounting flange
AC	Phillips head mounting screws
AD	Rotor bearing housing

4. If replacing the token cable also, the electronics cover must be removed in order to unplug the other end of the token cable. See FIG. 20, page 17.

### Install New Encoder

1. Plug the encoder connector (AE) and control board connector (AF) into the encoder (21). If replacing the encoder cable also, place the encoder connector through the motor housing and into the control board (see FIG. 20, page 17). Re-install the electronics cover.

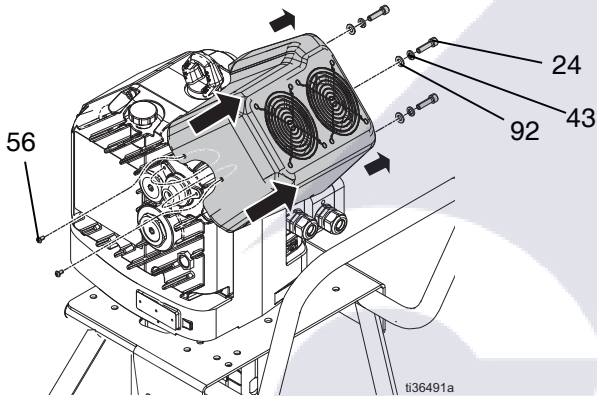


**FIG. 26: Install New Encoder**

2. Slide the new encoder onto the rotor shaft.
3. Apply a small amount of blue (medium) thread locker to the two Phillips head mounting screws (AC) and secure the encoder mounting flange (AB) to the motor housing.
4. Remove the two set screws (AA) from the encoder hub using the included 0.050 in. hex wrench.
5. Apply a small amount of blue (medium) thread locker to the set screws (AA) and screw back into the encoder. Tighten to 50 +/- 5 in.-oz (0.35 N•m).
6. Re-install the motor cover.
7. Re-install the fan shroud.

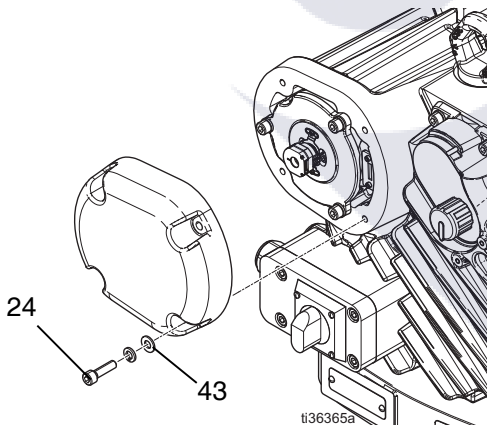
## Repair Token Cable

1. Follow the **Pressure Relief Procedure** on page 10.
2. Disconnect unit from power source.
3. Remove screws (56, 24) that attach the fan assembly to the driver and pull up on the end farthest from the junction box. Slide the assembly toward the junction box to remove.



**FIG. 27: Remove Fan**

4. Use a 6 mm Allen wrench to remove the last bolt (24) and washer (43) from the motor cover.



**FIG. 28: Remove Motor Cover**

5. Remove 12 screws (24) and washers (43) from electronics cover (3). See FIG. 16, page 16.

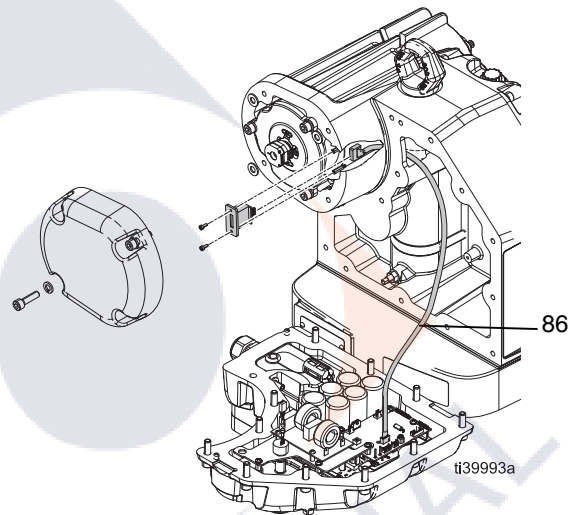
**NOTE:** The junction box does not need to be removed or disassembled.

6. Carefully remove electronics cover (3). See FIG. 17, page 17.

### NOTICE

Hold the cover in place while disconnecting the token cable or let the cover rest on a work surface to avoid damaging the wires and connections.

7. Check the token cable (86) connections. Replace the wire if it is damaged.



**FIG. 29: Token Cable**

8. Install the electronics cover (3) and tighten 12 screws (24) and washers (43). Torque to 15-20 ft-lb (20-27 N•m).

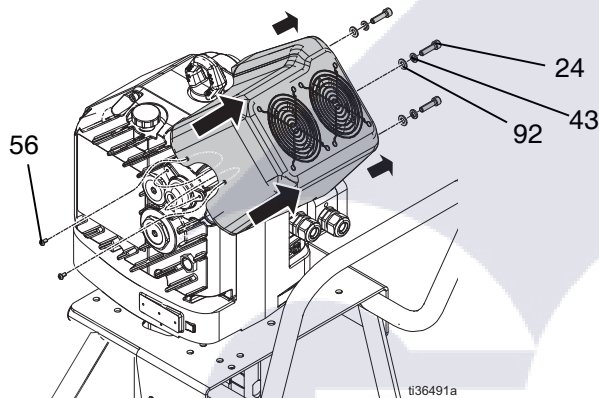
### NOTICE

If wires get pinched when the cover screws are tightened, damage will occur. Make sure all wires are positioned inside the cover before installation.

9. Reinstall the motor cover (4) and fan shroud (93).

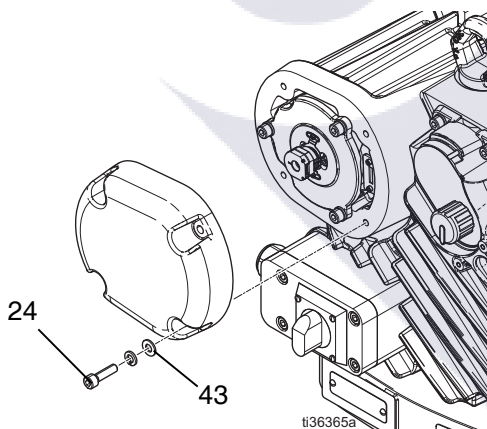
## Software Update Procedure

1. Follow the **Pressure Relief Procedure** on page 10.
2. Disconnect unit from power source.
3. Remove screws (56, 24) that attach the fan assembly to the driver and pull up on the end farthest from the junction box. Slide the assembly toward the junction box to remove.



**FIG. 30: Remove Fan**

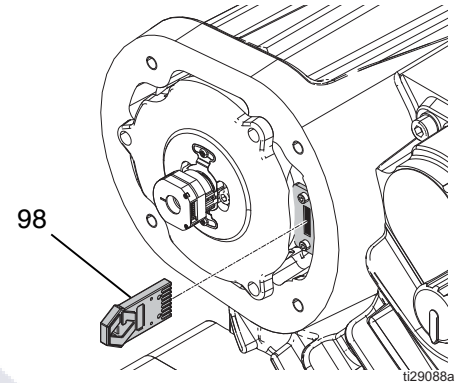
4. Use a 6 mm Allen wrench to remove the last bolt (24) and washer (43) from the motor cover.



**FIG. 31: Remove Motor Cover**

5. Insert and press the token (98) firmly into the token connector slot.

**NOTE:** The token requires no specific orientation.



**FIG. 32: Insert Token**

6. Reinstall the motor cover and fan assembly.
7. Apply power and turn the disconnect switch (S) ON.
8. Monitor the Status Indicator Light (L) for the status of the software update.
  - a. The Status Indicator Light will blink slowly for a few seconds and then rapidly for several seconds.
  - b. Once the update is complete, the unit will power up and flash out the software version. Three numbers will be flashed out to convey the software version in the format of x.yy.zzz. For example:  
“flash-pause-flash-flash-pause-flash-pause” would indicate that software version is 1.02.001 installed.
9. The unit will flash out the software version every time the unit is powered up while the software token is present.

**NOTE:** The token can remain in place even after the software has been updated.

10. The latest software version for each system can be found at [www.graco.com](http://www.graco.com).

# Parts

## Electric Driver

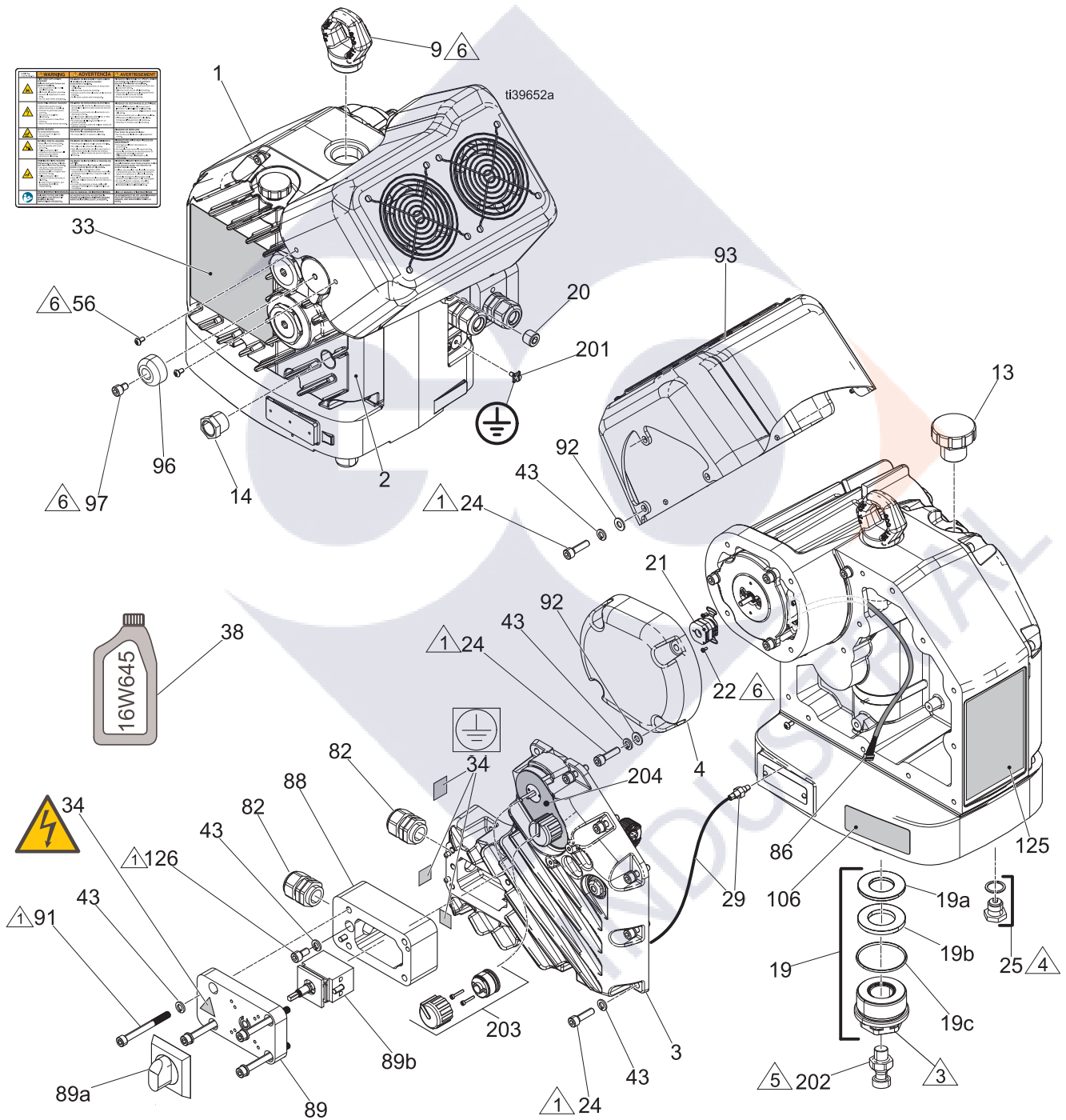


FIG. 33: Electric Driver Parts



## Parts List - Electric Driver (25P291)

Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
1	-----	HOUSING, main	1	93	24V290	COVER, fan, assembly, with wire harness	1
2	-----	COVER, gear	1			[includes Ref. 24 (3x), 43 (3x), 56 (2x), 92 (2x), 94 (2x)]	
3*	25P489	KIT, electronics, non-haz, E70	1	94	-----	FERRULE, 16 gauge twin wire (see <b>Wiring Diagrams</b> , page 27)	2
4	-----	COVER, motor, machining	1	96	127721	KNOB, impact control, preventer	1
9	15F931	RING, lift, sst 1 9/16 thrd	1	97	127463	SCREW, cap, socket head, M5 x 1.25-12 mm	1
13	15H525	CAP, fill	1	98	25F047	SOFTWARE, token, upgrade (not shown)	1
14	24E315	SIGHT GLASS, oil	1	106	17G768	LABEL, instruction, error code	1
19	25C164	CARTRIDGE, output seal, assy	1	107	102478	STRAP, tie wiring (see <b>Wiring Diagrams</b> , page 27)	2
19a	25C162	WASHER, support	1	125	-----	LABEL, product	1
19b	25C163	BUMPER, lower	1	126	115264	SCREW, cap, socket head, M8 x 1.25-16 mm	1
19c	25C165	O-RING, (2-pack)	1	201	116343	GROUND SCREW, M5 x 0.8-12mm	4
20	555448	PLUG, stl 3/8 pipe hex soc	1	202	15H392	ADAPTER, rod, xtreme	1
21	25C169	ENCODER, with cable assy (includes Ref. 22, qty. 2)	1	203	16U113	KNOB, assembly	1
22	-----	SCREW, mach, pn hd, #4-40 unc x 0.25 in. long	2	204	25U020	LABEL, knob, dual, high/low amp	1
24	109114	SCREW, cap, sch, M8 x 1.25-30 mm	27				
25	15H432	PLUG, oil drain	1				
29	24W120	SENSOR, stroke position	1				
33▲	17J476	LABEL, safety, warning	1				
34▲	16T764	LABEL, warning	1				
38★	16W645	LUBRICANT, oil, gear	0.3				
43	104572	WASHER, lock spring	32				
56	124165	SCREW, bhcs, M5-0.8 x 10, ss	2				
82	121171	GRIP, cord, .35-.63, 3/4	2				
86	16Y491	CABLE, token	1				
88	25C171	SLEEVE, junction box	1				
89	25C172	COVER, junction box, assembly (includes Ref. 34, 89a, 89b)	1				
89a	17H229	KNOB, without threaded collar	1				
89b	123970	SWITCH, disconnect block	1				
91	25C170	SCREW, shc, M8 x 1.25 x 80	4				
92	108788	WASHER, flat	4				

\* 25P489 KIT, electronics, cover

[includes 20, 24 (12x), 34, 43 (13x), 82, 94 (2x), 107 (2x), 126]

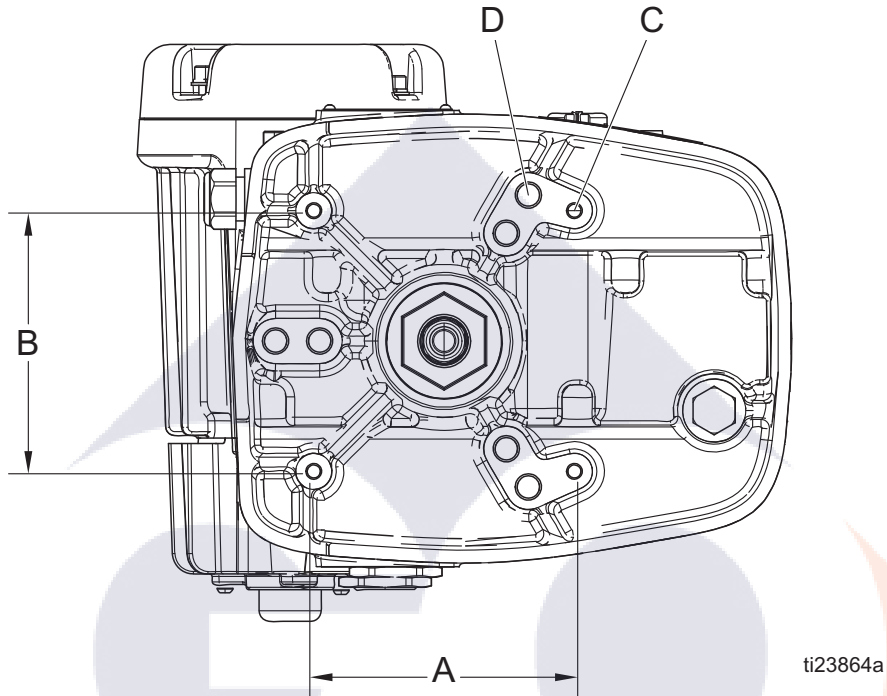
★ The driver gear-box is shipped from the factory pre-filled with oil. Additional oil must be purchased separately.

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

### Part Specifications:

Ref.	Instruction
1	Torque to 20 N•m (15 ft-lb).
3	Apply grease, then torque to 275 N•m (200 ft-lb)
4	Torque to 25 N•m (18 ft-lb)
5	Apply serviceable medium thread locker, then torque to 200 N•m (150 ft-lb).
6	Apply serviceable medium threadlocker.

## Mounting Hole Pattern

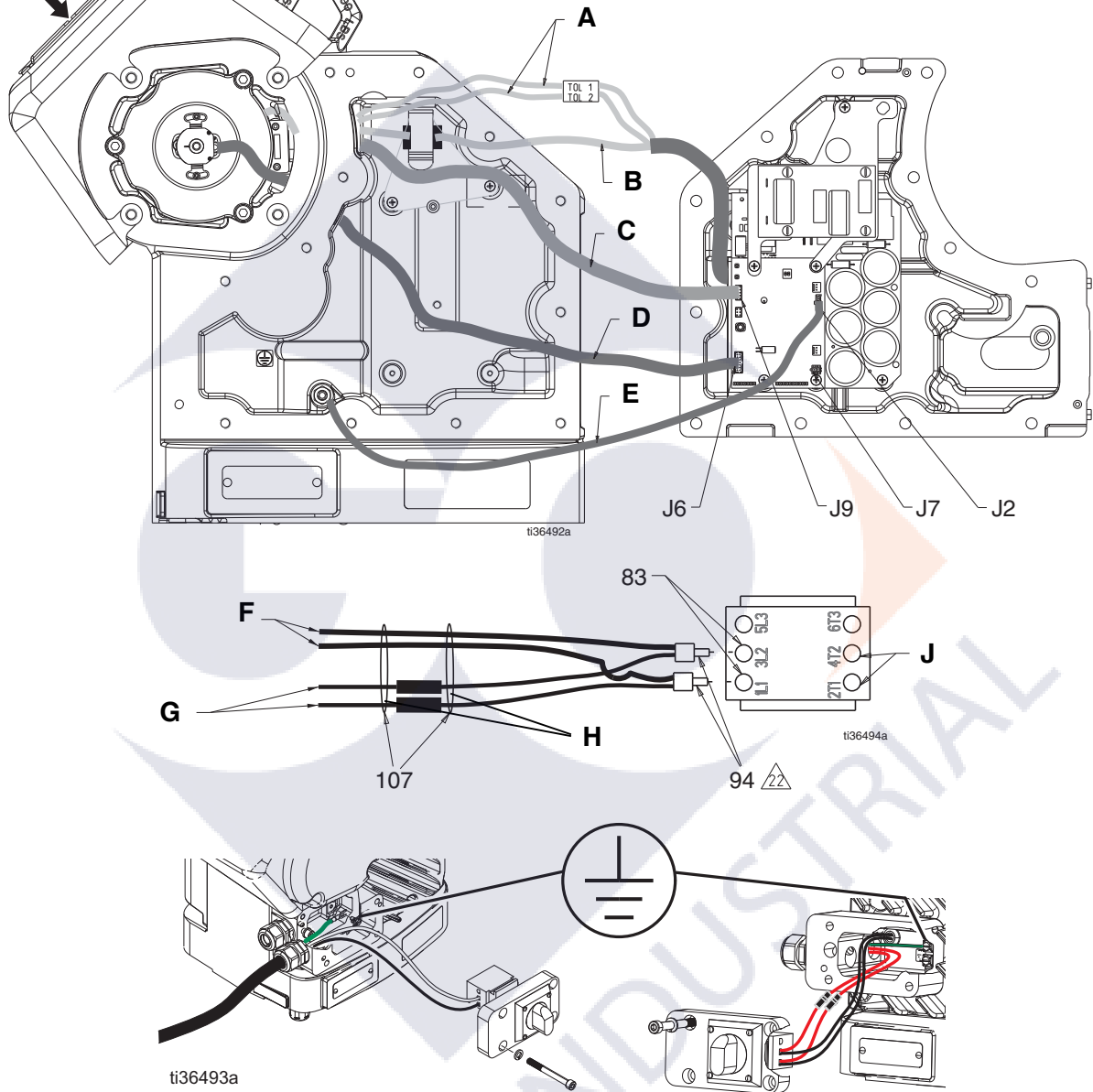


**FIG. 34: Mounting Hole Pattern**

A	B	C	D
6.186 in. (157 mm)	6.186 in. (157 mm)	Four 3/8-16 Mounting Holes	Six 5/8-11 Tie Rod Holes: 8 in. (203 mm) x 120° bolt circle OR 5.9 in. (150 mm) x 120° bolt circle

# Wiring Diagrams

AIR FLOW  
DIRECTION

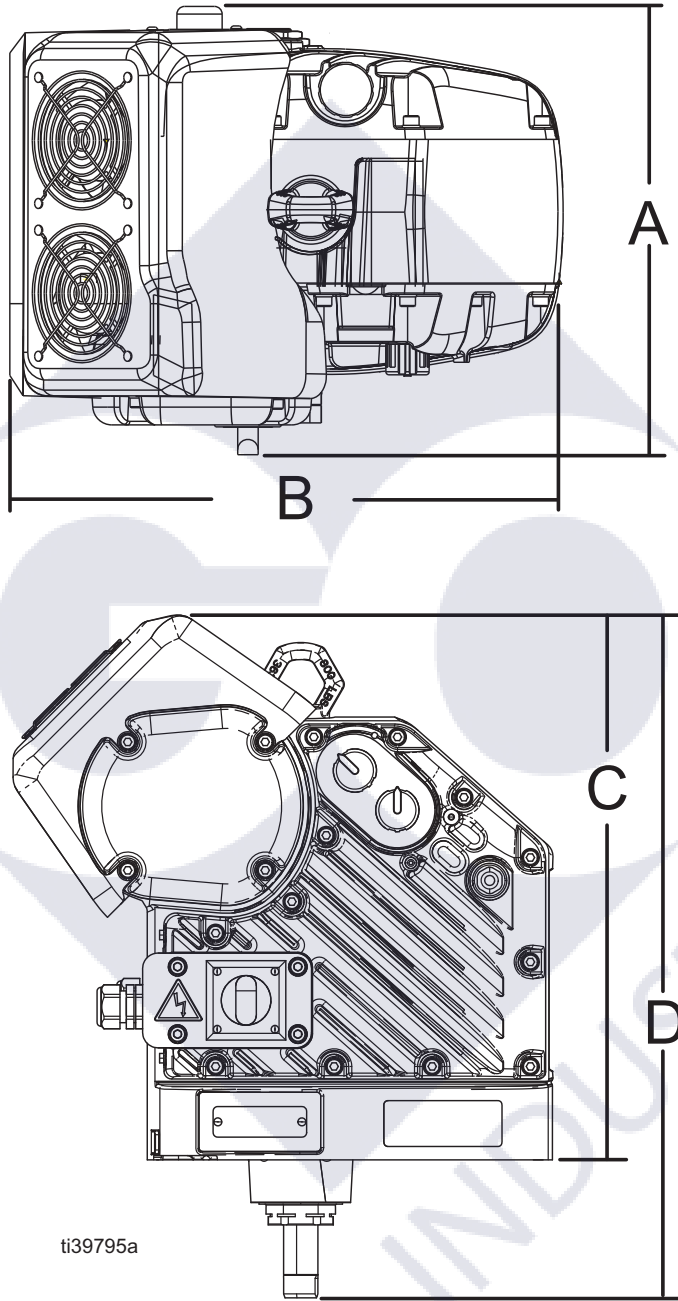


**FIG. 35: Wiring Diagram**

Ref.	Description
A	Motor temperature sensor wires
B	Motor wires
C	Token cable
D	Encoder cable

Ref.	Description
E	Stroke position sensor wire
F	Circuit board power wires
G	Fan power wires
H	Fan fuse holders
J	Incoming power

# Dimensions



Driver Dimensions		
A	Width	15.3 in. (38.8 cm)
B	Depth	18.3 in. (46.5 cm)
C	Mounted Height	18.3 in. (46.5 cm)
D	Total Height	21.5 in. (54.6 cm)

# Technical Specifications

<b>E70/E60 King Electric Driver Model 25P291</b>		
	<b>US</b>	<b>Metric</b>
Maximum continuous cycle rate (To prevent premature pump wear, do NOT exceed maximum recommended speed of fluid pump)	40 cycles per minute	
Weight	115 lb	52 kg
Operating temperature range	23° to 120° F	-5° to 50° C
Input power	100-120 VAC, single phase, 50/60 Hz, 30A	
	200-240 VAC, single phase, 50/60 Hz, 20A	
Power inlet port size	3/4-14 npt (female)	
Minimum recommended generator size	6.5 kW (5 kW for 100-120 V)	
Oil capacity†	1.5 quarts	1.4 liters
Oil specification†	Graco part number 16W645 ISO 220 silicone-free synthetic EP gear oil†	
Maximum dynamic force	4650 lbf	21 kN
<b>Sound Emissions for Normal Operation (&lt;20 cpm)</b>		
Sound Pressure*	<80 dBA	
*measured 3.28 feet (1 meter) from equipment, ISO-9614-2.		

† The driver gear-box is pre-filled with oil. Additional oil must be purchased separately.

## California Proposition 65

### CALIFORNIA RESIDENTS

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

## Recycling and Disposal

### End of Product Life

At the end of a product's useful life, recycle it in a responsible manner.

# Graco Extended 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.

Description	Warranty Period
Gear train, chassis, and electric motor	36 Months
Electronics cover and all other King Driver parts	12 Months

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 hereunder must be brought within the latter of two (2) years of the date of sale, or one (1) year after the warranty period expires.

**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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## Graco Information

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

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