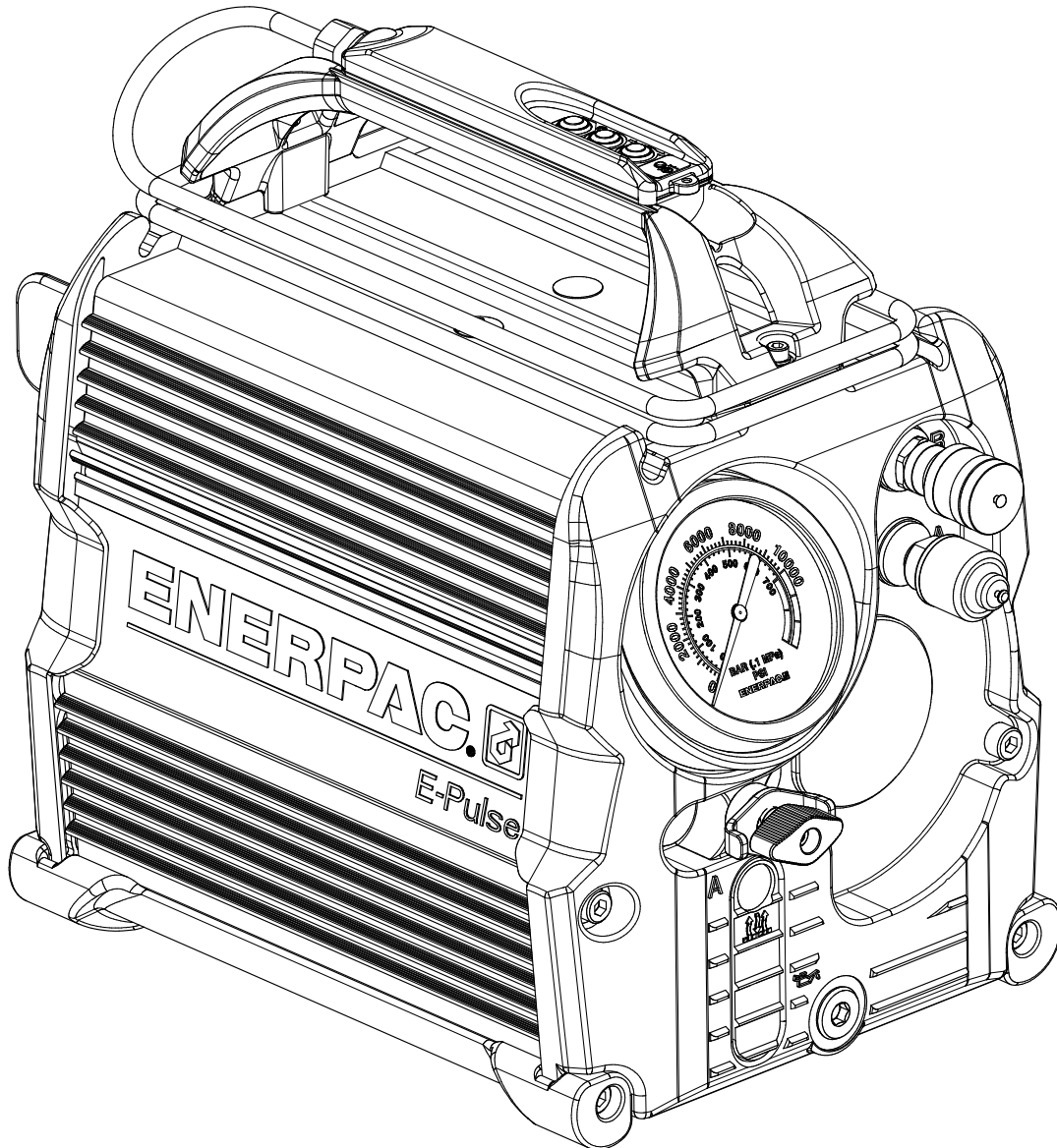


**Instruction Sheet**

**E-Series  
Electric Torque Wrench Pump**

**To protect your warranty, use only ENERPAC hydraulic oil.**



**Models:**

- EP3504TB and EP3504TB-M
- EP3504TI and EP3504TI-M
- EP3504TE and EP3504TE-M

## Table of Contents:

<p><b>1.0 SAFETY.....3</b></p> <p>    1.1 Important Safety Instructions.....3</p> <p>    1.2 General Hydraulic Safety Precautions...3</p> <p>    1.3 Electrical Safety .....3</p> <p>        1.3.1 Electrical Safety Precautions .....3</p> <p>        1.3.2 Use and Care.....4</p> <p>        1.3.3 Disconnecting Power .....4</p> <p>        1.3.4 Grounding Instructions .....4</p> <p>        1.3.5 Use Of Extension Cords.....4</p> <p>    1.4 Bolting Pump Safety Precautions .....5</p> <p>    1.5 Additional Precautions.....5</p> <p>    1.6 IP Ratings (Ingress Protection, IEC standard 60529) .....5</p> <p>    1.7 Safety Hazard Alert Symbols.....5</p> <p><b>2.0 PRODUCT DATA.....6</b></p> <p>    2.1 Specifications .....6</p> <p>    2.2 External Dimensions .....6</p> <p>    2.3 Pump Performance Curves .....7</p> <p><b>3.0 MAJOR FEATURES AND COMPONENTS.....8</b></p> <p><b>4.0 PRODUCT DESCRIPTION.....9</b></p> <p>    4.1 Introduction.....9</p> <p>    4.2 Conformance to National &amp; International Standards .....9</p> <p>    4.3 Electromagnetic Compatibility (EMC) .9</p> <p><b>5.0 PREPARATION FOR USE .....9</b></p> <p>    5.1 Important Receiving Instructions.....9</p> <p>    5.2 Connecting Hydraulic Hoses.....9</p> <p>    5.3 Disconnecting Hydraulic Hoses .....9</p> <p>    5.4 Hydraulic Reservoir .....10</p> <p>    5.5 Hydraulic Reservoir Air Breather/Filter.....10</p>	<p><b>6.0 FEATURES AND CONTROLS.....10</b></p> <p>    6.1 Carrying Handle .....10</p> <p>    6.2 Ventilation and Cooling System .....10</p> <p>    6.3 Pendant .....10</p> <p><b>7.0 SET-UP AND GENERAL OPERATION INFORMATION .....11</b></p> <p>    7.1 Before Start-up .....11</p> <p>    7.2 Pump Operating Positions.....11</p> <p>    7.3 Air Removal .....11</p> <p>    7.4 Operating Precautions .....11</p> <p><b>8.0 AUTO-CYCLE OPERATION .....12</b></p> <p>    8.1 Pressure Adjustment - Auto-Cycle Mode.....12</p> <p>    8.2 Torquing - Auto-Cycle Mode .....12</p> <p><b>9.0 MANUAL OPERATION .....13</b></p> <p>    9.1 Pressure Adjustment - Manual Mode .13</p> <p>    9.2 Torquing - Manual Mode .....13</p> <p><b>10.0 DEPRESSURIZING THE SYSTEM.....13</b></p> <p><b>11.0 HYDRAULIC SYSTEM MAINTENANCE.....14</b></p> <p>    11.1 Hydraulic Oil Information .....14</p> <p>    11.2 Checking the Oil Level .....14</p> <p>    11.3 Adding Oil .....14</p> <p>    11.4 Oil Change.....15</p> <p>    11.5 Pump Priming/Air Purging .....15</p> <p><b>12.0 CLEANING AND INSPECTION .....16</b></p> <p><b>13.0 STORAGE .....16</b></p> <p><b>14.0 TROUBLESHOOTING .....16</b></p> <p><b>15.0 PUMP FAULT CODES (user-level) .....19</b></p> <p><b>16.0 QUICK REFERENCE GUIDE - PENDANT CONTROLS .....20</b></p>
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## 1.0 SAFETY

### 1.1 Important Safety Instructions

Read all instructions carefully. Follow all recommended safety precautions to avoid personal injury as well as damage to the pump and/or damage to other property. Enerpac cannot be responsible for any damage or injury from unsafe use, lack of maintenance or incorrect operation. Do not remove warning labels, tags, or decals. In the event any questions or concerns arise, contact Enerpac or a local Enerpac distributor for clarification.

#### SAVE THIS INSTRUCTION SHEET FOR FUTURE USE

Appropriate training in the safe use of high pressure, high force hydraulic tools is required prior to the operation of the pump. If training is needed, contact your local Enerpac distributor or authorized service center for information about an Enerpac hydraulic safety training course.

This manual follows a system of safety alert symbols, signal words and safety messages to warn the user of specific hazards. Failure to comply with these warnings could result in death or serious personal injury, as well as damage to the equipment or other property.



The **Safety Alert Symbol** appears throughout this manual. It is used to alert you to potential physical injury hazards. Pay close attention to Safety Alert Symbols and obey all safety messages that follow this symbol to avoid the possibility of death or serious personal injury.

Safety Alert Symbols are used in conjunction with certain Signal Words that call attention to safety messages or property damage messages and designate a degree or level of hazard seriousness. The Signal Words used in this manual are WARNING, CAUTION and NOTICE.



Indicates a hazardous situation that, if not avoided, **could** result in death or serious personal injury.



Indicates a hazardous situation that, if not avoided, **could** result in minor or moderate personal injury.



Indicates information considered important, but not hazard related (e.g. messages relating to property damage). Please note that the Safety Alert Symbol will **not** be used with this signal word.

### 1.2 General Hydraulic Safety Precautions



**Failure to observe and comply with the following precautions could result in death or serious personal injury. Property damage could also occur.**

- Do not remove or disable the pressure relief valve.
- Never set the relief valve to a higher pressure than the maximum rated pressure of the pump.
- To avoid personal injury, keep hands and feet away from torque wrench during operation.
- Do not handle pressurized hydraulic hoses. Escaping oil under pressure can penetrate the skin. If oil is injected under the skin, see a doctor immediately.
- Do not pressurize disconnected couplers.

- The system operating pressure must not exceed the pressure rating of the lowest rated component in the system.
- Do not exceed equipment ratings of 10,000 psi [700 bar]. Overloading causes equipment failure and possible personal injury.
- Wear personal protective equipment (P.P.E.) when operating hydraulic equipment. Always wear eye protection. Safety equipment such as dust mask, non-skid safety shoes, hard hat, or hearing protection used for appropriate conditions will reduce personal injuries.
- Immediately replace worn or damaged parts with genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage.



**Failure to observe and comply with the following precautions could result in minor or moderate personal injury. Property damage could also occur.**

- Do not use or repair damaged hydraulic hoses. Avoid sharp bends and kinks when routing hydraulic hoses. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose, leading to premature hose failure.
- Do not drop heavy objects on hoses. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.
- Do not lift hydraulic equipment by the hoses or swivel couplers. Use the carrying handle or shoulder strap, if provided.
- Keep hydraulic equipment away from flames and heat. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials.
- Protect all hydraulic equipment from weld spatter.
- Immediately replace worn or damaged parts with genuine Enerpac parts. Enerpac parts are designed to fit properly and to withstand high loads. Non-Enerpac parts may break or cause the pump to malfunction.

**NOTICE** Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Enerpac Authorized Service Center in your area.

### 1.3 Electrical Safety

#### 1.3.1 Electrical Safety Precautions



**Failure to observe the following instructions and precautions could result in death or serious personal injury.**

- High voltage is present inside the pump even when motor is off. Before opening the pump housing or performing any maintenance or repairs, be sure that the pump power cord is disconnected from the electrical outlet or other electrical power source (refer to additional safety information in Section 1.3.6 of this manual).
- Always be certain that the pump is stopped and disconnected from AC power supply before performing any inspection, maintenance or repair procedure.
- Do not leave the pump unattended in the workplace when connected to AC power supply. Take all reasonable precautions to avoid unauthorized use.
- Take precautions so that the pump is not switched on accidentally.

- If it is not possible to unplug the pump power cord from the AC power outlet, the power must be turned off and locked out at the AC power supply.
- Always disconnect the pump from AC power supply before transporting it.
- Do not use the pump if it cannot be switched on and off using the pendant. Pump must be repaired before use.
- Make sure the pump cooling vents and fins are unobstructed and free of dirt or dust.
- Do not service or clean the pump while the pump is operating and/or if pump is connected to AC power supply.
- Keep the pump out of the reach of children. Do not allow inexperienced users or users who have not read the instructions to operate them.

### 1.3.2 Use and Care



**Failure to observe and comply with the following precautions could result in death or serious personal injury. Property damage could also occur.**

- Store the pump indoors. Keep in a secured area to prevent use by unauthorized personnel.
- Do not clean the pump with a water spray or the like.
- Do not operate the pump with a damaged cord or plug, or after the pump malfunctions or is dropped or damaged in any manner. Return the pump to the nearest Enerpac authorized service center for examination, repair, or electrical or mechanical adjustment.

### 1.3.3 Disconnecting Power



**Failure to observe and comply with the following precautions could result in death or serious personal injury. Property damage could also occur.**

- Be sure that the pump is off before removing plug from electrical outlet.
- Do not unplug the pump by pulling on the cord. To unplug, grasp the plug, not the cord.
- Remove plug from electrical outlet when the pump is not in use and before servicing or cleaning the pump.

### 1.3.4 Grounding Instructions



**Failure to observe the following instructions and precautions could result in death or serious personal injury**

- The pump must be properly grounded. In the event of malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. The pump is equipped with a cord having an equipment grounding conductor.
- A grounding plug is included with the cord. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

- Improper connection of the pump grounding conductor can result in electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes is the pump grounding conductor.
- If the cord and/or plug are damaged, do not connect the pump to a live electrical outlet. Repair or replace the damaged items as required and be sure the grounding conductor is properly wired before reconnecting the pump to the outlet. Consult a qualified electrician if grounding conductor wiring procedures are not completely understood or if there is any doubt as to whether the pump is properly grounded.
- Do not modify the plug provided with the pump. If the plug will not fit in the outlet, have a proper outlet installed by a qualified electrician.
- A qualified electrician should be consulted if there is any doubt as to whether an outlet box is properly grounded.
- The pump is equipped with an electric power cord and plug specific to its rated single-phase voltage. No adapter should be used with the plug.
- If the pump must be reconnected for use on a different type of electric circuit, the reconnection should be made by a qualified electrician. After the reconnection, the pump should comply with all local codes and ordinances.

### 1.3.5 Use Of Extension Cords



**Failure to observe the following instructions and precautions could result in death or serious personal injury.**

- Use the proper size extension cord with the pump power cord when use of an extension cord is necessary. A qualified electrician should be consulted to help specify and select the proper size extension cord. The marked electrical rating of the extension cord should be at least as great as the electrical rating of the pump.
- The extension cord should be a grounding-type 3-wire cord for single-phase power.
- A long extension cord should be arranged so that it will not drape over any working area where it can be tripped over, snagged, or pulled on unintentionally.
- If the pump is to be operated outdoors and an extension cord is needed, use only an outdoor-use extension cord. An outdoor-use extension cord will be clearly marked with the suffix letter “W” and the statement “Suitable for Use with Outdoor Appliances.”

### 1.3.6 Opening the Pump Case (E-Series Pumps)



**High voltage is present inside the pump even when motor is off. Before opening the pump case, always disconnect the pump power cord from the electrical outlet and wait at least 2 minutes for residual (stored) electrical energy to discharge. Do not reconnect the power cord while pump case is open.**

**Failure to observe these precautions could result in a dangerous and potentially lethal electric shock. Death or serious personal injury could occur.**

The pump contains no user serviceable electronic or electrical components. Servicing of these items must be performed only by an Enerpac Authorized Service Center or other qualified service facility.



The following safety information is provided for service technician use:

- Residual (stored) electrical energy may remain present in the pump electronics for up to 2 minutes after the power cord is disconnected. There is a risk of electric shock if the case halves (at top of pump) are opened during this time.
- Before opening the case halves, always disconnect pump power cord from electrical outlet and wait at least 2 minutes to allow full discharge of residual (stored) electrical energy in the pump electronics.
- Take precautions to ensure that power remains disconnected while the case halves are open. If power is reconnected, high voltage will be immediately present at the application board heat sink (electrical shock hazard).
- Do not operate the pump with the case halves open. Always close and secure the case halves before reconnecting power cord.

#### 1.4 Bolting Pump Safety Precautions



**Failure to observe and comply with the following precautions could result in death or serious personal injury. Property damage could also occur.**

- Never attempt to connect or disconnect hoses while the pump is on and/or the system is pressurized.
- Always be sure that the pump is stopped and all pressure is fully relieved (0 psi/bar) before disconnecting or connecting hydraulic hoses. The sudden and uncontrolled release of pressurized oil could occur if hoses are disconnected while under pressure.
- Be certain that all hose couplers are fully connected at both the pump and wrench ends before applying any hydraulic pressure. If the couplers are not fully connected, oil flow will be blocked, and the drive unit could be subjected to excessive hydraulic pressures. Catastrophic failure of wrench or pump could result.
- Be aware that a nut or bolt that breaks off during operation of the pump and wrench may become a high velocity projectile.

#### 1.5 Additional Precautions

**WARNING** Do not use electric pumps in an explosive atmosphere. Sparks and electrical arcing could ignite combustible vapors or airborne dust.

**CAUTION** To prevent damage to the pump electric motor, check power specifications on pump data plate. Use of incorrect outlet could damage the motor.

#### 1.6 IP Ratings (Ingress Protection, IEC standard 60529)

- The pump IP rating is IP54.
- The pendant IP rating is IP67.
- Outdoor use is permitted.
- Exposure to dust and moisture is permitted in accordance with the stated IP rating. However, the pump should be stored in a dry and protected environment when not in use.
- Do not immerse the pump in water or other liquids.
- Do not allow water jets to contact the pump.

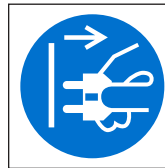
#### 1.7 Safety Hazard Alert Symbols

**WARNING** Failure to observe and comply with the safety hazard alert symbols affixed to the pump could result in death or serious personal injury.

Safety hazard alert symbols (decals, labels, etc.) are affixed to the pump. Observe these symbols and understand their meaning before using the pump.



**Read instructions:** Read the product instruction sheet before operating the product and before performing any inspection, adjustment, maintenance or repair procedures. (Figure 1, Item A)



**Disconnect Electrical Power:** To avoid the possibility of a dangerous and potentially lethal electrical shock, disconnect pump power cord from AC electrical power supply and wait at least 2 minutes before opening the pump case. (Figure 1, Item B)

Make sure the safety hazard alert symbols are legible and securely affixed to the pump. If worn or missing, obtain replacements from Enerpac. Refer to Figure 1 for locations.

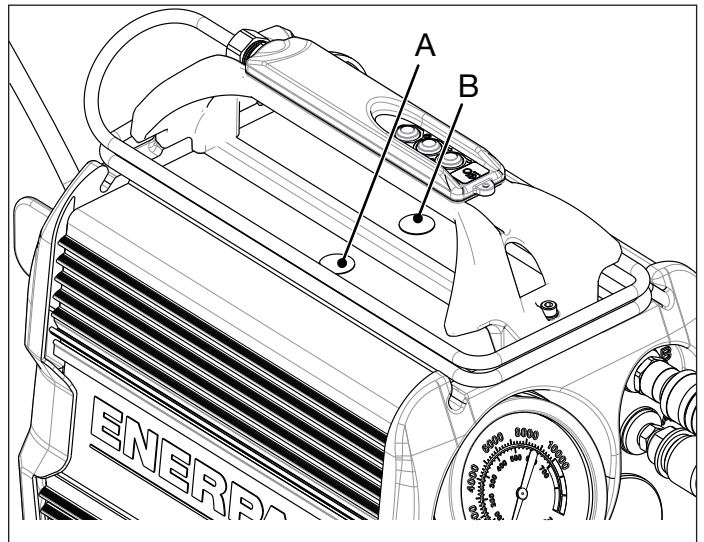


Figure 1, Locations of Safety Hazard Alert Symbols

## 2.0 PRODUCT DATA

### 2.1 Specifications

Pump Model Number	Control Valve Type	For Use With:	Hydraulic Connections *	Weight **		Usable Oil Capacity ***		Oil Type
				lb	kg	gal	l	
EP3504T_	4-Way, 2-Position	Torque Wrench	Enerpac Spin-On hydraulic couplers (1 male, 1 female)	44.9	20.4	0.8	3.0	Enerpac HF
EP3504T_-M	4-Way, 2-Position	Torque Wrench	Enerpac Spin-On hydraulic couplers (2 male, 2 female)	47.9	21.7	0.8	3.0	Enerpac HF

\* Enerpac Spin-On hydraulic couplers are included with pump. Pump hydraulic port thread size is 1/4" NPTF.  
 \*\* Approximate weight of pump including oil.  
 \*\*\* Approximate usable oil capacity of pump hydraulic reservoir (excludes pump elements).  
 Pump total oil capacity (including reservoir and pump element housing) is approximately 1.14 gallons [4.33 liters].

Pump Model Number	Pump Type	Maximum Hydraulic Working Pressure *		Flow Rate at Maximum Speed								Motor Speed Range
				At 14.5 psi [1 bar]		At 2538 psi [175 bar]		At 5,075 psi [350 bar]		At 10,000 psi [700 bar]		
				psi	bar	in <sup>3</sup> /min	l/min	in <sup>3</sup> /min	l/min	in <sup>3</sup> /min	l/min	
EP3504T_	2 Stage	10,000	700	220	3.61	130	2.13	58	0.95	32	0.52	600-2400
EP3504T_-M	2 Stage	10,000	700	220	3.61	130	2.13	58	0.95	32	0.52	600-2400

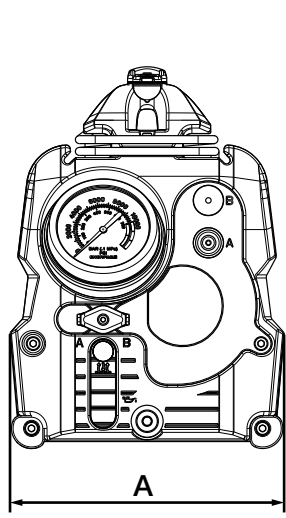
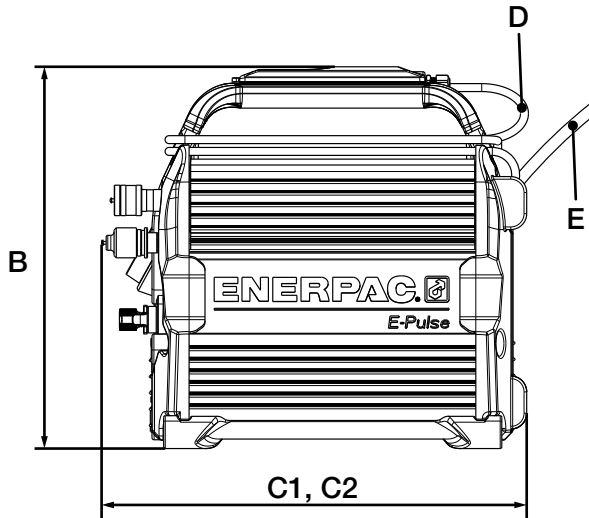
\* Maximum pressure setting of pump is mechanically limited to approximately 10,300-10,800 psi [710-745 bar].

Pump Model Number Ending In: *	Input Power						Motor Output Rating		Operating Temp Range **		Sound Level LWA ***
	Nominal Voltage Range	Phase	Hz	Max. Amps	Max. kW	Plug Type	hp	kW	°F	°C	dB
B or B-M	100-120 VAC	1	50-60	12.0	1.12	NEMA 5-15	0.85	0.63	-22 to +122	-30 to +50	70-85
I or I-M	200-250 VAC	1	50-60	7.0	1.26	NEMA 6-15	0.85	0.63	-22 to +122	-30 to +50	70-85
E or E-M	200-250 VAC	1	50-60	7.0	1.26	Schuko CEE 7/7	0.85	0.63	-22 to +122	-30 to +50	70-85

\* Pump models with the -M suffix are equipped with multi-port manifolds.  
 \*\* At 85% relative humidity.  
 \*\*\* Sound level will vary depending on pump speed and load.

### 2.2 External Dimensions

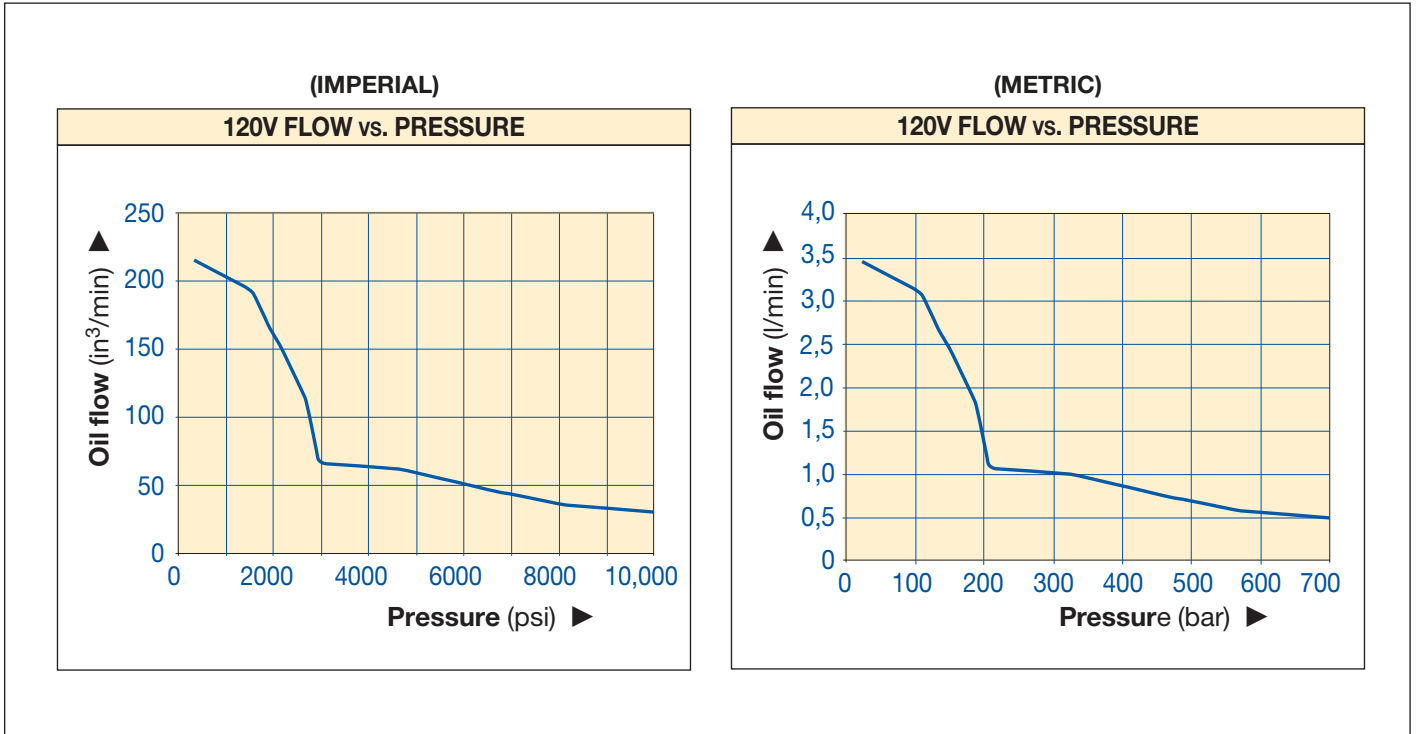
Item	Dimension	
	inch	mm
A	10.2	258
B	14.2	361
C1*	15.8	401
C2**	16.9	429
	ft	m
D (pendant cable)	20	6.0
E (power cord)	2.0	0.6

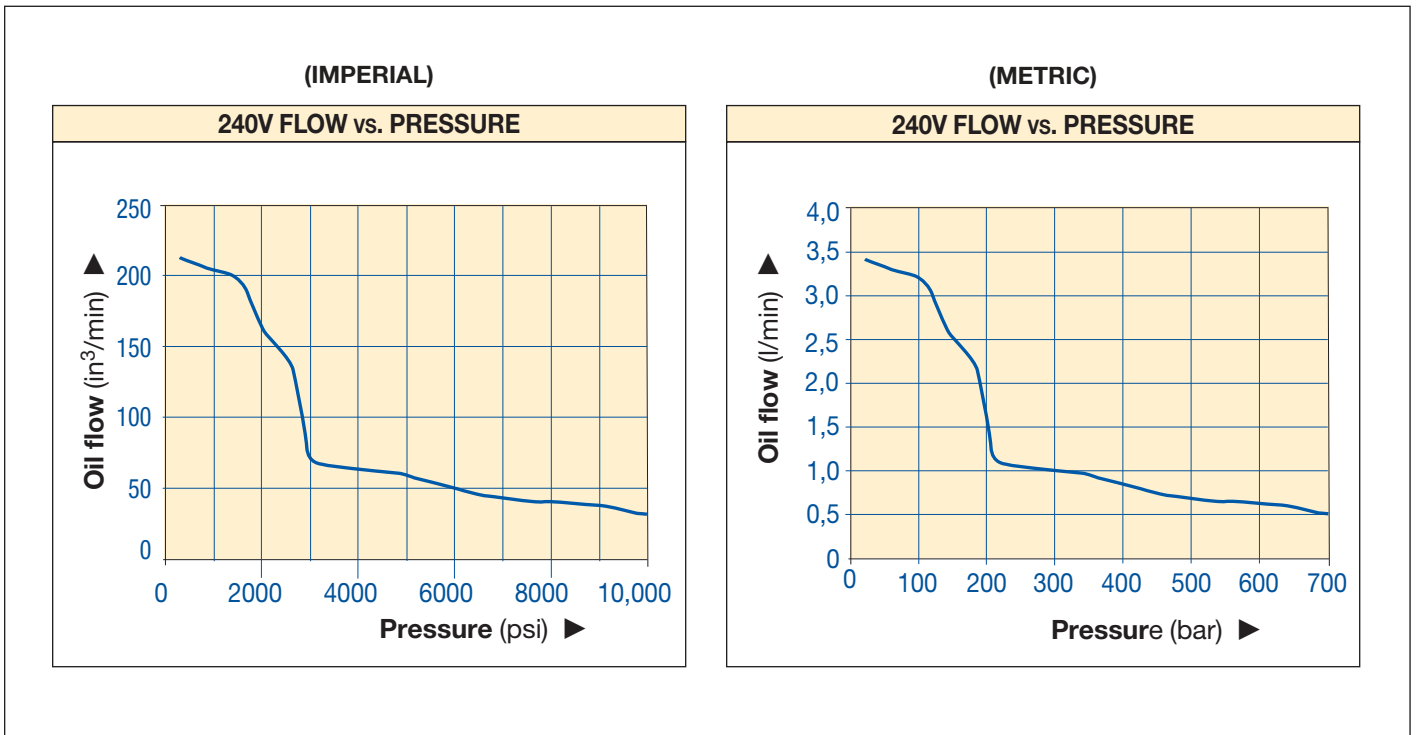
\* Models ending in B, I or E.  
 \*\* Models ending in B-M, I-M or E-M (equipped with multi-port manifolds).

### 2.3 Pump Performance Curves

#### Pump model numbers ending in "B" and "B-M"



#### Pump model numbers ending in "I", "I-M", "E" and "E-M"



### 3.0 MAJOR FEATURES AND COMPONENTS

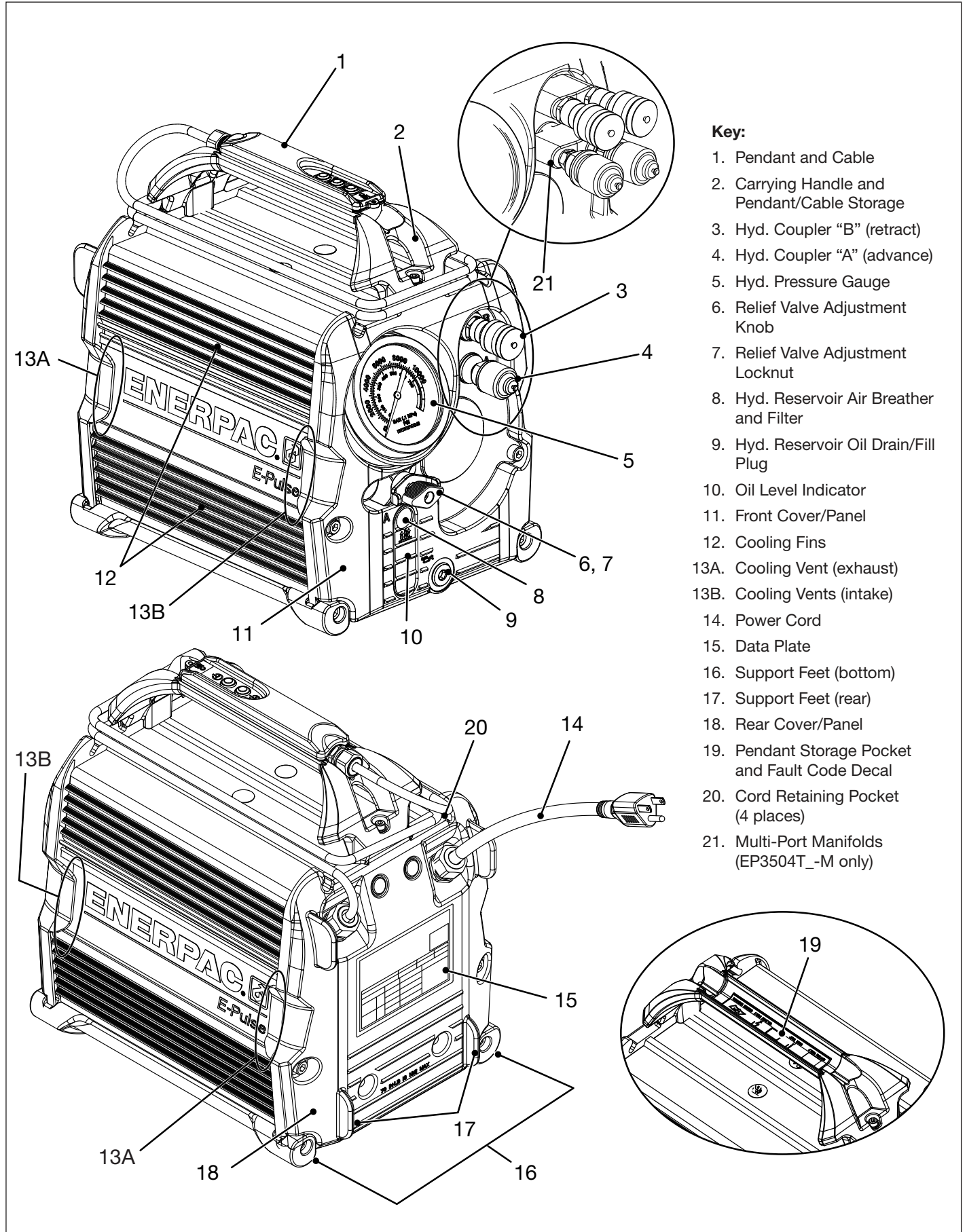


Figure 2, Major Features and Components, E-Series Electric Torque Wrench Pumps



## 4.0 PRODUCT DESCRIPTION

### 4.1 Introduction


The Enerpac E-Series electric torque wrench pump is designed for use with hydraulic torque wrenches rated at 10,000 psi [700 bar] maximum operating pressure.

Features include:

- User selectable auto-cycle or manual mode operation.
- Remote control 3-button *Smart IQ* pendant with LED status indicator light.
- High efficiency permanent magnet direct drive motor.
- Durable and lightweight all aluminum chassis construction.
- Two-stage pump design for fast system fills and controlled flow at high pressures.
- Six discreet pump elements provide even flow and smooth operation.
- Integrated fan forced heat exchanger and built-in thermal protection.
- Built-in user and service center diagnostic features.

Refer to Figure 2 for a diagram of the pump's major features and components.

### 4.2 Conformance to National & International Standards

 Enerpac declares that the E-Series pumps have been tested and conform to applicable standards and are approved to carry the CE, TUV C and US, and FCC certification marks. An EU declaration of conformity is included in the shipment.

### 4.3 Electromagnetic Compatibility (EMC)

Enerpac E-Series pumps have been tested and certified to conform to CE-EMC Emission and Immunity standards and to FCC emission standards.

## 5.0 PREPARATION FOR USE


### 5.1 Important Receiving Instructions

Visually inspect all components for shipping damage. Shipping damage is not covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

To help prevent oil leakage during transit, a shipping plug with built-in absorbent pad is installed over the reservoir air breather (located at the top of the oil level indicator). The plug is retained by a rubber band which is stretched around the pump housing. After unpacking the pump, remove the rubber band and shipping plug. Never operate pump with shipping plug installed.


### 5.2 Connecting Hydraulic Hoses

Couplers must be polarized per Figure 3 for correct wrench operation. All hoses, fittings and components used with the pump must be rated for at least 10,000 psi [700 bar] operation.

 **WARNING** Avoid kinking or tightly bending hoses. Do not exceed the hose manufacturer's stated minimum bend radius. If a hose becomes kinked or otherwise damaged, it must be replaced. Damaged hoses may rupture at high pressure. Serious personal injury may result.

Make hydraulic connections to pump couplers "A" and "B" as described in the following steps. Refer to Figure 3.

1. To prevent the pump from starting, be sure that the pump power cord is disconnected from the AC power source.
2. Verify that pump hydraulic pressure gauge indicates zero (0) psi/bar. If any pressure is indicated, relieve pressure as described in Section 10.0 of this manual.


 **NOTICE** The pump is supplied with coupler halves pre-installed in the pump hydraulic ports. These coupler halves are compatible with Enerpac THQ Series torque wrench hoses.

3. Remove dust caps from pump couplers "A" and "B".
4. Connect the hose from the advance side of the torque wrench to pump coupler "A". Hand tighten the collar on the female coupler until it is fully threaded onto the male collar.
5. Connect the hose from the retract side of the torque wrench to pump coupler "B". Hand tighten the collar on the female coupler until it is fully threaded onto the male collar.

 **WARNING**

**At each hose connection, be certain that the male and female coupler halves are engaged and fully threaded together. Failure to follow this precaution may result in high pressure oil leakage and/or detachment of the hose under pressure. Skin penetration and serious personal injury could occur.**

6. Ensure couplers are fully engaged and tightened before operating. Partial coupler engagement will prevent proper wrench operation.

 **NOTICE** When a torque wrench is first connected to the pump, air may be trapped in the hydraulic circuit. Refer to Section 7.3 for air removal procedure.

### 5.3 Disconnecting Hydraulic Hoses

Disconnect hydraulic hoses after use as described in the following steps:

1. Be sure the torque wrench is fully retracted.
2. Verify that pump hydraulic pressure gauge indicates zero (0) psi/bar. If any pressure is indicated, relieve pressure as described in Section 10.0 of this manual.
3. Disconnect the pump AC power cord from the electrical outlet.
4. At pump couplers "A" and "B", loosen the threaded collars on the female couplers. Disconnect hoses from pump.
5. To prevent contamination, install dust covers over pump and hose couplers.

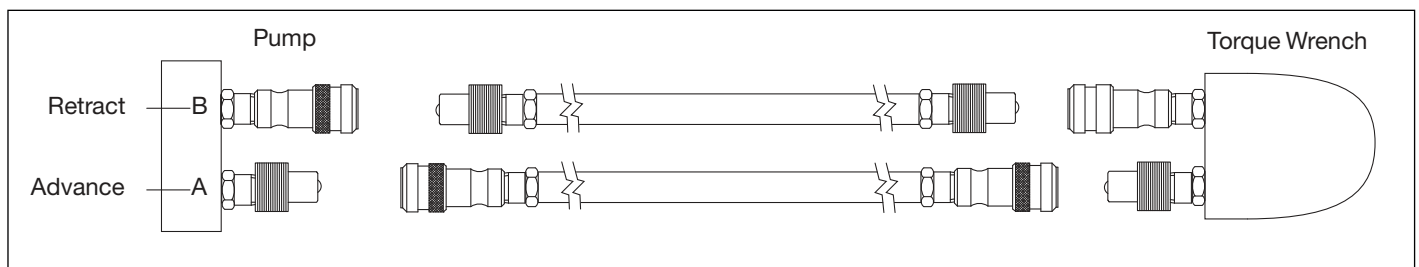


Figure 3, Hydraulic Hose Connections (typical)

## 5.4 Hydraulic Reservoir

For most shipping destinations, the hydraulic reservoir is pre-filled at the factory with Enerpac HF hydraulic oil.

However, as a precaution, always check the oil level before starting the pump. The oil level indicator is located on the pump front panel. Refer to Figure 8 for oil level diagram.

Verify that the oil level is up to the FULL mark. Refer to Section 11.2 for oil level checking procedure. If the oil level is low, add additional oil as required as described in Section 11.3.

## 5.5 Hydraulic Reservoir Air Breather/Filter

The hydraulic reservoir air breather is located just above the oil level indicator. It is composed of a porous stainless steel filter disc and a pre-loaded two-way vent. The vent allows air exchange while maintaining a small positive pressure or vacuum in the reservoir.

Air breather components are factory pre-installed and require no user assembly or adjustment.

Before operating the pump, be sure to remove the shipping plug covering the air breather. Refer to Section 5.1 for additional information.

Note that a small amount of oil may collect on the air breather surface while the pump is being transported. This is normal. However, to prevent possible oil leakage through the air breather, avoid tilting the pump forward while the pump is being operated, transported or stored.

## 5.6 Power Requirements

E-Series pumps are available in a choice of three different electrical power configurations:

- Models EP3504TB and EP3504TB-M are designed to operate at a nominal voltage of 100-120 VAC. These units contain a USA style NEMA 5-15 power plug.
- Models EP3504TI and EP3504TI-M are designed to operate at a nominal voltage of 200-250 VAC. These units contain a USA style NEMA 6-15 power plug.
- Models EP3504TE and EP3504TE-M are designed to operate at a nominal voltage of 200-250 VAC. These units contain a European style “Schuko” power plug.

All configurations are single-phase, 50-60 Hz.

Before connecting electrical power to the pump, be certain that the AC power supply is the proper voltage. Refer to the pump data plate. Also refer to Section 1.3 for important electrical safety information and precautions.



**Failure to follow the electrical safety precautions contained in Section 1.3 of this manual could result in electric shock. Death or serious personal injury could occur.**

## 6.0 FEATURES AND CONTROLS

### 6.1 Carrying Handle

Always use the carrying handle when transporting the pump to its desired location or when it is necessary to reposition the pump while it is in use.

The top of the carrying handle contains a storage pocket for the pendant. The base of the carrying handle contains a storage area for the pendant cable.

A fault code reference diagram is located inside the pendant storage pocket.

**NOTICE** To prevent possible damage, never attempt to carry or reposition the pump by dragging it by the hydraulic hoses, power cord or pendant cable. Damage to the pump, pendant and/or hoses may result.

### 6.2 Ventilation and Cooling System

Air intake and exhaust vents are located on the inside edges of the pump front and rear covers. These vents function with the pump's internal fan-forced heat exchanger to help maintain allowable operating temperatures.

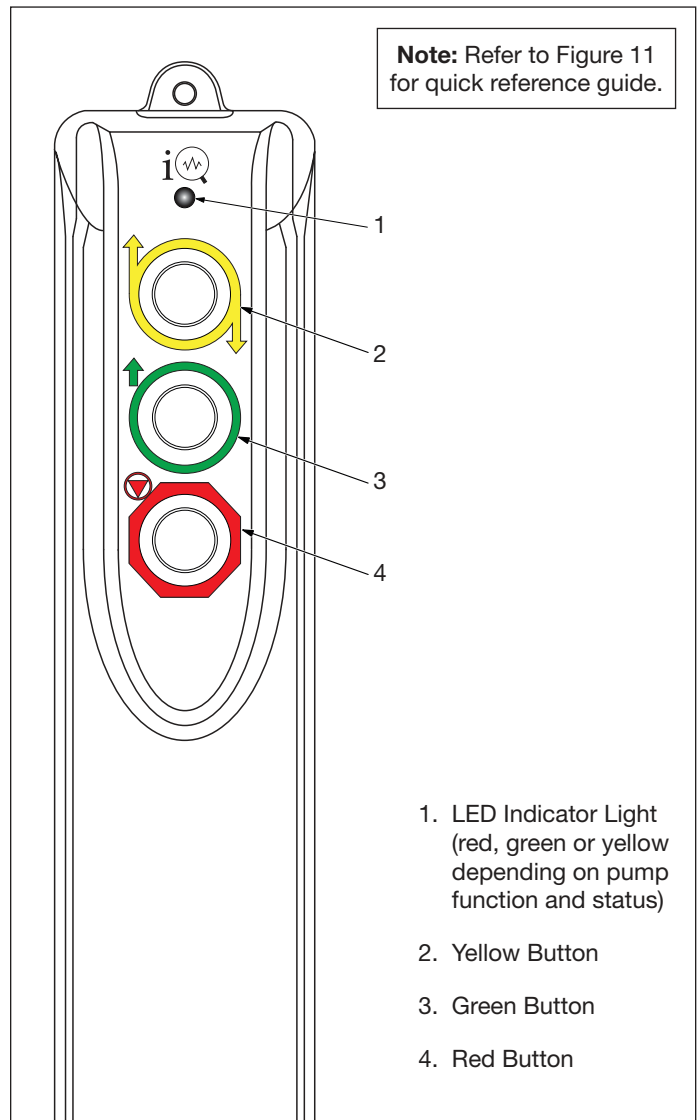
Cooling fins are also located on the pump sides.

Before start-up, check that the cooling fins and vents are not covered by dirt or other obstructions.

### 6.3 Pendant

The pump includes a three-button corded pendant that operates pump functions. It is connected to the pump with a 20 ft [6 m] cable.

A multi-color LED indicator light communicates pump status. See Figure 4. Pendant operation is described in detail in Sections 8.0 through 10.0 of this manual.



**Figure 4, Pendant Controls**

## 7.0 SET-UP AND GENERAL OPERATION INFORMATION

### 7.1 Before Start-up

1. Check the hydraulic oil level. Add oil if necessary. Refer to Sections 11.1 through 11.3.
2. Connect hydraulic hoses to pump as described in Section 5.2.
3. Connect pump to a compatible AC power supply of the proper voltage for the pump model. Input power specifications are listed on the pump data plate and also in Section 2.1.
4. Remove air from system before placing pump into operation. Refer to instructions in Section 7.3.
5. Check all hydraulic hoses, couplers and fittings to be sure they are tight and leak free.

### 7.2 Pump Operating Positions

During operation, the pump can be positioned in the normal horizontal position or vertically on its back cover as shown in Figure 5.

If needed, the pump can be tilted rearward on an angle, provided that it is adequately supported so that it does not slide, tip over or drop.

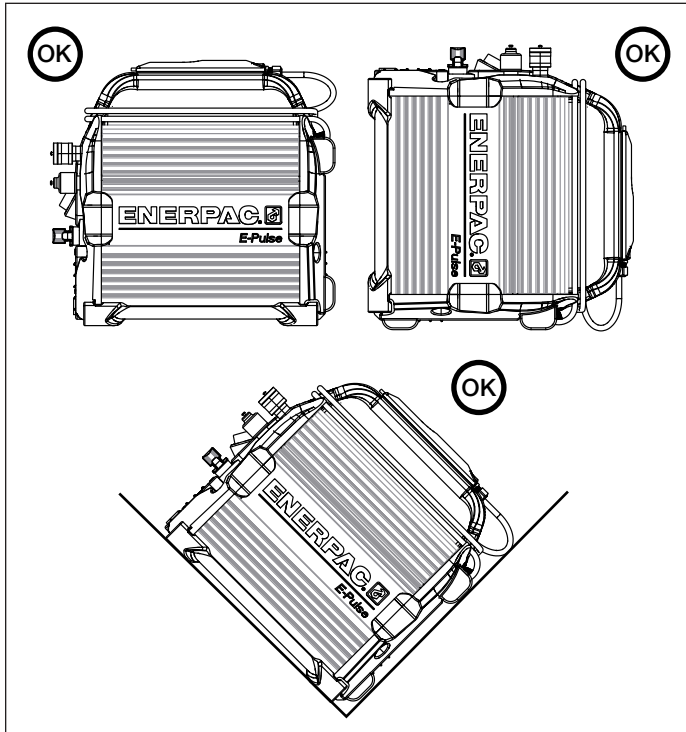


Figure 5, Allowable Pump Operating Positions

To prevent oil leakage and/or damage to pump:

- Never operate the pump while it is positioned on its right or left sides, or in the inverted (upside-down) position.
- Never operate the pump in a tilted forward position. Oil leakage and/or damage to pump may result.

See Figure 6.

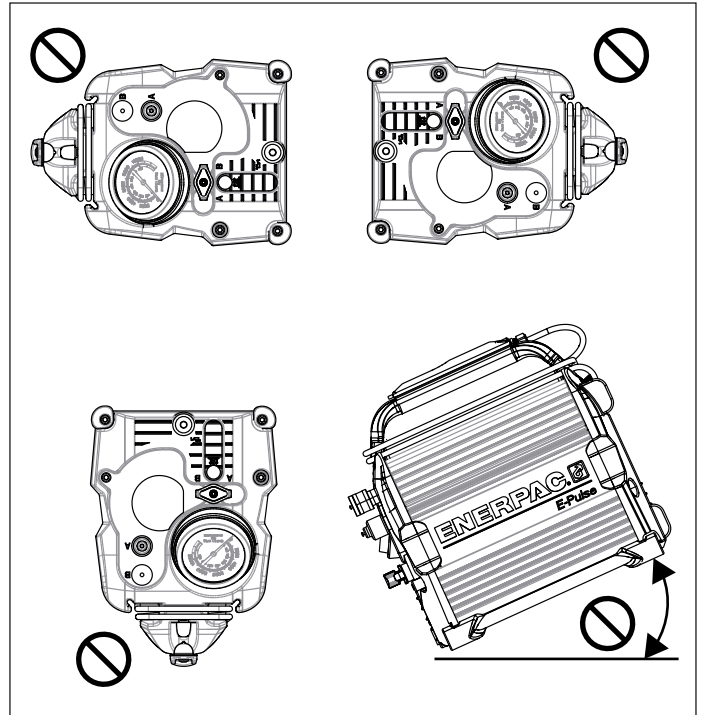


Figure 6, Pump Operating Positions - NOT ALLOWED

### 7.3 Air Removal

When the torque wrench is connected for the first time, air may be trapped in the wrench and hoses. To ensure smooth, safe operation, run the torque wrench through several complete advance-retract cycles before placing the pump into service. Do this with no load on the torque wrench and with the pump positioned higher than the torque wrench.

When the torque wrench advances and retracts smoothly and without hesitation, the air has been vented from the system.

### 7.4 Operating Precautions



**Failure to observe the following precautions and instructions may result in death or serious personal injury.**

- Be sure the nut threads properly engage with the threads of the bolt, and that cross-threading has not occurred.
- Avoid making sudden start-stop movements (“shock loading”). Failure to observe these precautions may cause a catastrophic failure of the wrench to occur, and wrench components under high tension could become dangerous projectiles.
- If the torque wrench stalls at any time, press any pendant button to stop auto-cycle operation or release the green pendant button if using manual mode.
- Continuously monitor the torque wrench and fastener during pump operation. Stop torquing procedures immediately if any problems occurs.
- Refer to the manufacturer's manuals provided with the torque wrench for wrench operation instructions, maintenance procedures and safety precautions.

- Never leave the pump unattended while it is being operated using the pendant “Auto Cycle” mode. The pump will continue to run until it is stopped by the user, the desired torque is reached or after 8 cycles if left unattended and not on a tightening joint. Operation must be monitored continuously.

## 8.0 AUTO-CYCLE OPERATION

### 8.1 Pressure Adjustment - Auto-Cycle Mode

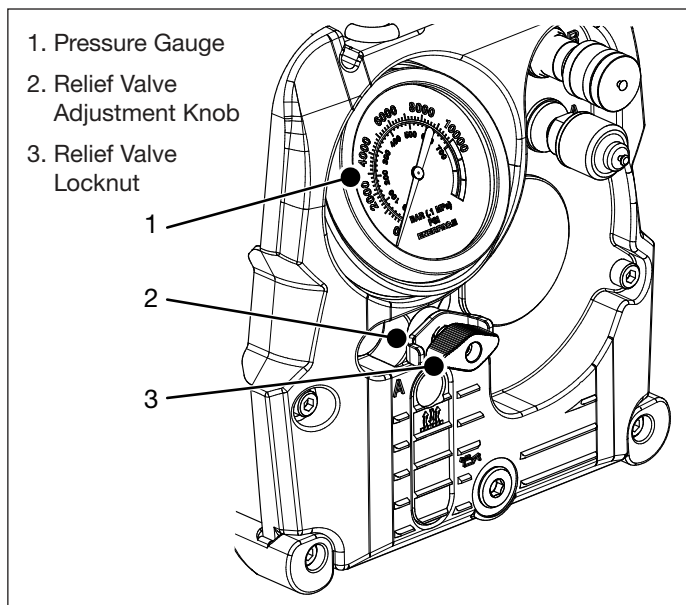


**Failure to observe and comply with the following precautions could result in death or serious personal injury. Property damage could also occur.**

- Always make pressure adjustments before putting torque wrench on nut or bolt head.
  - Pressure setting must be adjusted to provide the correct torque and to ensure that excessive torque is not applied.
  - Do not adjust pressure settings while pump is in use.
1. Press and hold the red pendant button. Refer to Figure 4.
  2. While holding the red pendant button, press and hold the yellow pendant button. The pendant LED indicator light will blink red twice and the pendant will vibrate.

**NOTICE** Steps 1 and 2 reset the stored pressure to zero (0) psi/bar if a stored pressure had been previously set.

3. Loosen the relief valve locknut and turn the relief valve adjustment knob counterclockwise until there is a light drag when turning. Refer to Figure 7.



**Figure 7, Relief Valve Adjustment**

4. Press and hold the green pendant button to start pump motor and advance the valve to the A position.

**NOTICE** The green pendant button must be held down during the entirety of steps 5 through 8. Releasing the green pendant button will stop pump motor.

5. Turn the relief valve adjustment knob clockwise to increase pressure to desired value.

**NOTICE** To obtain an accurate setting, decrease the pressure to a point below the final setting and then slowly increase the pressure until it reaches the final setting.

6. Tighten the relief valve locknut when the pressure gauge reading is stable and is at the desired pressure.
7. Release the green pendant button.
8. Recheck the final pressure setting by holding the green pendant button and pressurizing the system.
9. If the final pressure setting is not at the desired setting, then repeat the procedure described in steps 3 through 8. If the final pressure setting is at the desired setting, then proceed to step 10.
10. While holding the green pendant button and when the pump reaches the previously set pressure, press the yellow pendant button.
11. Release the yellow and green pendant buttons. The pendant LED indicator light will blink yellow, the pendant will vibrate three times when stored pressure is recorded, the valve will retract and the motor will turn off.

**NOTICE** The pump will save the stored pressure (within the available range of 1000 to 10,000 psi [70 to 700 bar]) even after long periods of non-use.

### 8.2 Torquing - Auto-Cycle Mode



- To stop the pump during auto-cycle mode at any point, press any button on the pendant.
- Variables such as ambient temperature, pump internal temperature and hydraulic hose length may cause the pressure gauge to show a slightly lower reading than the relief pressure setting before the retract cycle is activated. This is normal.
- The internal pressure transducer and pump microprocessor precisely control the switching between advance and retract cycles, assuring that the stored pressure has been met.
- Auto cycle mode will only work if a stored pressure is recorded.

To torque in auto-cycle mode, perform the following steps:

1. Place torque wrench on nut or bolt.
2. Press the yellow pendant button for one advance cycle or three seconds whichever is shorter.
3. The pump and torque wrench will continuously perform advance and retract cycles. The pendant LED indicator light will blink yellow during operation and the pendant will vibrate after each advance cycle is completed.

**NOTICE** If the torque wrench stalls prior to fully stroking, then the target torque has been reached.

4. When desired torque is reached, the pump will do an additional verification cycle then retract and turn off. The pendant LED indicator light will blink green and yellow and the pendant will also vibrate.



## 9.0 MANUAL OPERATION

### 9.1 Pressure Adjustment - Manual Mode



Failure to observe and comply with the following precautions could result in death or serious personal injury. Property damage could also occur.

- Always make pressure adjustments before putting torque wrench on nut or bolt head.
  - Pressure setting must be adjusted to provide the correct torque and to ensure that excessive torque is not applied.
  - Do not adjust pressure settings while pump is in use.
1. Press and hold the red pendant button. Refer to Figure 4.
  2. While holding the red pendant button, press and hold the yellow pendant button. The pendant LED indicator light will blink red twice and the pendant will vibrate.

**NOTICE** Steps 1 and 2 reset the stored pressure to zero (0) psi/bar if a stored pressure had been previously set. It is not necessary to reset stored pressure. Manual mode will still function if a pressure is stored, but pump pressure will not exceed the stored pressure.

3. Loosen the relief valve locknut and turn the relief valve adjustment knob counterclockwise until there is a light drag when turning. Refer to Figure 7.
4. Press and hold the green pendant button to start pump motor.

**NOTICE** The green pendant button must be held down during the entirety of steps 5 through 8. Releasing the green pendant button will stop pump motor.

5. Turn the relief valve adjustment knob clockwise to increase pressure to desired value.

**NOTICE** To obtain an accurate setting, decrease the pressure to a point below the final setting and then slowly increase the pressure until it reaches the final setting.

6. Tighten the relief valve locknut when the pressure gauge reading is stable and is at the desired pressure.
7. Release the green pendant button.
8. Recheck the final pressure setting by holding the green pendant button and pressurizing the system.
9. If the final pressure setting is not at the desired setting, then repeat the procedure described in steps 3 through 8. If the final pressure setting is at the desired setting, then proceed to step 10.
10. Press and hold the green pendant button. When the pump reaches the previously set pressure, press the yellow pendant button.
11. Release the yellow and green pendant buttons.
12. The pendant LED indicator light will blink yellow and the pendant will vibrate three times when stored pressure is recorded.

**NOTICE** The pump will save the stored pressure (within the available range of 1,000 to 10,000 psi [70 to 700 bar]) even after long periods of non-use.

### 9.2 Torquing - Manual Mode

1. Place torque wrench on nut or bolt.
2. Press and hold the green pendant button to begin an advance cycle. Pendant will vibrate and the indicator light will blink green until within  $\pm 250$  psi [17 bar] of the stored pressure is reached.

#### **NOTICE**

- If stored pressure was reset and a new setting was not entered, the pump will continue to build pressure until the manual relief valve setting (Section 9.1 step 6) is reached.
  - If stored pressure exists and pump is run in manual mode, then:
    - Pendant LED indicator light blinks green if pressure is *below* stored pressure value.
    - Pendant LED indicator light blinks yellow if pressure is *equal to* stored pressure value.
    - Pendant LED indicator light blinks red if pressure is *above* stored pressure value.
  - The pump can be run in manual mode without entering a stored pressure setting. If there is no stored pressure setting, the pump pressure will build until it reaches the manual relief valve setting.
  - The pendant LED indicator light will blink green and the pendant will vibrate once when the pump motor is turned on.
  - The pendant will vibrate twice when the pump motor stops.
  - If relief pressure is achieved before the torque wrench fully advances, then desired torque has been achieved.
  - If relief pressure is not achieved before the torque wrench fully advances, then the desired torque has not been achieved and further cycles are required.
3. Release green pendant button to start a retract cycle.
  4. Repeat steps 2 and 3 until target torque is achieved.
  5. If inputs from the pendant are not received within three seconds of completing a retract cycle, then the pump will automatically dump all remaining system pressure and turn off.

## 10.0 DEPRESSURIZING THE SYSTEM

The pump automatically dumps system pressure whenever the pump motor stops whether manually or automatically under normal operating conditions. If pressure is trapped, to manually relieve pressure perform the following procedure:

**NOTICE** The pump must be connected to an AC power source for this procedure.

1. Be sure the pump motor is off.
2. Press and hold the red pendant button. Refer to Figure 4.
3. While holding the red pendant button, press and hold the green pendant button. Pressure gauge should now show zero (0) psi/bar.
4. After the pressure gauge shows zero (0) psi/bar, release red and green pendant buttons.



## 11.0 HYDRAULIC SYSTEM MAINTENANCE



Failure to observe and comply with the following precautions could result in death or serious personal injury. Property damage could also occur.

- To avoid accidental starting, be certain that the pump power cord is disconnected from the AC power supply before performing any maintenance procedures.
- Be certain that all system hydraulic pressure is completely relieved before performing any maintenance procedures. Refer to information in Section 10.0.

### 11.1 Hydraulic Oil Information

Enerpac HF hydraulic oil (ISO Grade 32) is the recommended oil for all E-Series pumps. This oil is suitable for most applications and working environments.

#### NOTICE

- Use of oils other than Enerpac HF may result in damage to pump hydraulic components and will void the Enerpac product warranty. Enerpac recommends using only Enerpac HF oil in the E-Series pumps.
- Never mix oils of different viscosities. Mixing oil viscosities may result in damage to pump components and will void the Enerpac product warranty.

### 11.2 Checking the Oil Level

1. Be sure that hydraulic torque wrench is fully retracted.
2. Be certain that pump is stopped and that all hydraulic pressure is fully relieved before continuing this procedure. Refer to Section 10.0.
3. Be sure that the pump is placed on a level surface.
4. Check the oil level indicator. Verify that the oil level is up to the full mark. Refer to Figure 8.

If oil level is low: Add oil as described in Section 11.3. Refer to Section 11.1 for oil specifications.

**NOTICE** Be sure that the oil is clean. If the oil has a milky, cloudy or dark appearance, it should be changed immediately as described in Section 11.4.

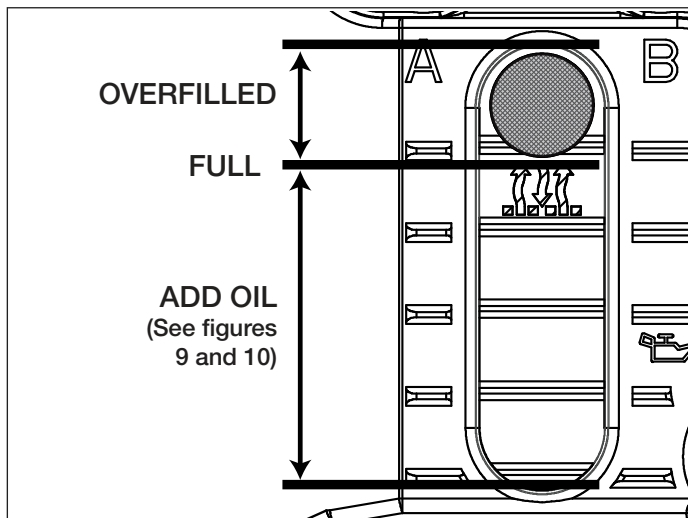


Figure 8, Oil Level Indicator

### 11.3 Adding Oil

1. Be sure that hydraulic torque wrench is fully retracted.
2. Be certain that pump is off and that all hydraulic pressure is fully relieved. Refer to Section 10.0 for additional information.
3. Disconnect pump AC power cord from electrical outlet.
4. Disconnect hydraulic hoses from pump.
5. With the pump in the normal (horizontal) operating position, check the oil level in the oil level indicator. Use the diagram in Figure 10 to determine the approximate amount of additional oil that must be added.
6. Place the pump on a stable and level work surface, with the front cover facing UP, and the rear cover supported by the work surface. See Figure 9.
7. Using a clean rag, remove any dirt from the area around the hydraulic reservoir drain/fill plug. Remove the drain/fill plug.

#### NOTICE

- Refer to Section 11.1 for oil specifications. Use only new oil poured from a clean container.
- Always use a funnel when adding oil. To avoid spillage and to ensure that pump internal venting functions properly during filling, funnel neck outer diameter must not exceed 1/2 inch [12 mm] or be less than 1/4" [6.3 mm]. Refer to Figure 9.
- Add oil only with the pump front panel facing up, and with the pump positioned on a level surface.
- When the maximum oil level is achieved, an internal overflow tube will direct oil to the concentric vents located around the oil drain/fill port. Stop adding oil immediately when oil begins flowing from these vents. Wipe up any spilled oil with a clean rag.
- Do not tilt or reposition the pump when adding oil. Overfilling and oil leakage will result.
- Remove and dispose of any spilled oil in accordance with all applicable laws and regulations.

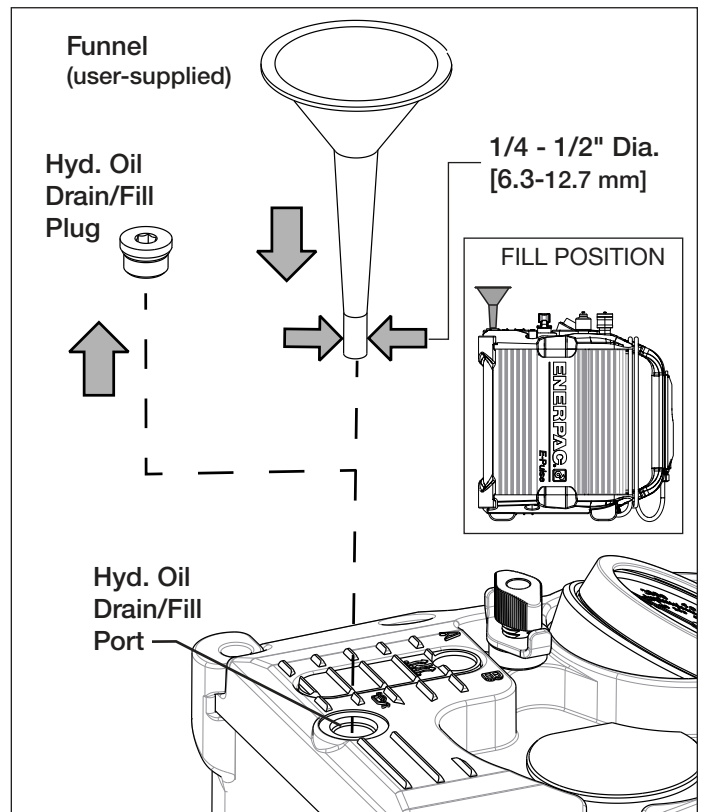


Figure 9, Adding Oil

8. Slowly pour new oil into the reservoir through the oil drain/ fill port. Continue pouring until excess oil begins flowing from the concentric vents around the oil drain/ fill port. This indicates that the reservoir is full.
9. After adding oil, wipe the oil drain/ fill plug with a clean rag and reinstall it. Torque to 13-16 ft-lb [17.6-21.7 Nm].
10. Place the pump in the normal (horizontal) operating position, with the carrying handle facing up.
11. Check the oil level indicator. Verify that the oil level is up to the FULL mark and that the reservoir is not overfilled. Refer to Figure 8.

**NOTICE**

- If the pump was previously operated with a very low oil level or run until the reservoir was emptied, perform the pump priming/ air purging procedure before using the pump. Refer to Section 11.5.
- If reservoir is accidentally overfilled (oil level above full mark), drain excess oil before using the pump.

**11.4 Oil Change**

1. Be sure that hydraulic torque wrench is fully retracted.
2. Be certain that pump is off and that all hydraulic pressure is fully relieved. Refer to Section 10.0 for additional information.
3. Disconnect pump AC power cord from electrical outlet.
4. Disconnect hydraulic hoses from pump.
5. Place the pump on a on a stable and level work surface.
6. Place a suitable pan or container of appropriate capacity under the oil drain/ fill plug.

**NOTICE**

- Pump total oil capacity (including reservoir and pump element housing) is approximately 1.14 gallons [4.33 liters]. Be sure the pan or container used is large enough to hold all the drained oil.
- DO NOT operate the pump motor to drain the oil. Serious permanent damage to pump internal components may result. Such damage is not covered under warranty.
- Remove and dispose of used hydraulic oil in accordance with all applicable laws and regulations.

7. Remove the oil drain/ fill plug. Allow all used oil to drain completely from the reservoir into the pan or container. It may be necessary to tilt the pump slightly forward to drain all the used oil.
8. Refill the reservoir with new hydraulic oil as described in Section 11.3.
9. Perform the pump priming/ air purging procedure. Refer to the instructions in Section 11.5.

**11.5 Pump Priming/Air Purging**

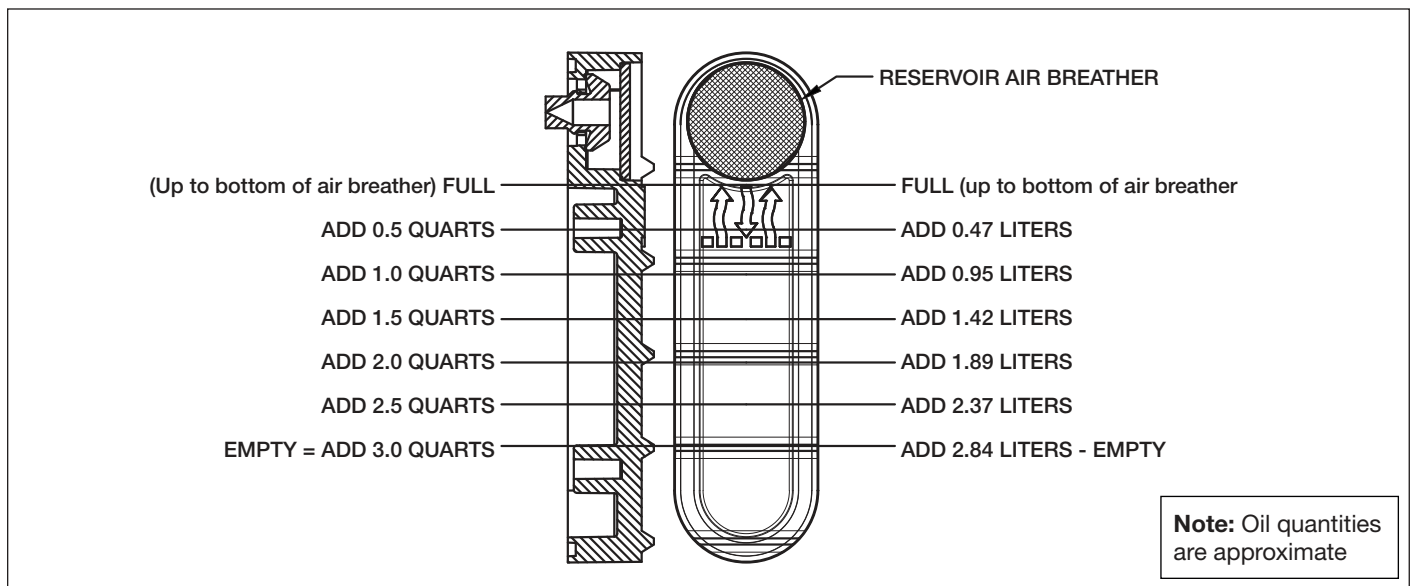
Always perform the pump priming/ air purging procedure after completing an oil change.

This procedure should also be performed if the pump reservoir has been refilled with oil after being accidentally run dry (with little or no oil remaining in reservoir).

**NOTICE** The pump will typically make a slapping, sloshing or whirring noise if air pockets are present inside the pump element housing. If the pump is not primed, there will be either very little noise or an erratic sounding noise.

Perform the pump priming/ air purging procedure as described in the following steps:

1. Be certain that pump is off and that all hydraulic pressure is fully relieved. Refer to Section 10.0 for additional information.
2. Disconnect hydraulic hoses from pump couplers.
3. With hoses disconnected, start and run the pump for approximately 10 seconds at a pressure setting of 3,250 psi [225 bar] or higher. This will remove any air trapped in the pump element housing.
4. Stop the pump. Verify that hydraulic pressure gauge indicates zero (0) psi/bar.
5. Repeat steps 3 and 4 as needed (typically 2-3 times).
6. Reconnect hydraulic hoses. Verify that pump operates without making abnormal noises and that torque wrench movement is smooth.



**Figure 10, Reservoir Oil Fill Guide**

## 12.0 CLEANING AND INSPECTION

- Periodically clean the cooling fins on the pump side surfaces to remove any accumulated dust or dirt.
- Remove any dust or dirt from the pump front and rear covers and the pump top and bottom surfaces. Be sure that all four air vents are unobstructed.
- Periodically wipe the air breather/filter surface with a clean rag to remove any loose dirt or oil sediment. The air breather/filter must remain unobstructed to allow proper reservoir venting.
- Be sure that pendant and controls are free of dust or dirt.
- To prevent contamination, always remove any dirt from around the oil drain/fill plug before removing it. Wipe the drain/fill plug with a clean rag before reinstalling it.
- Check for loose, missing or damaged parts. Make repairs as required before returning the pump to use.

## 13.0 STORAGE

Store the pump in a clean, dry and secure location.

To prevent possible damage to pump components, storage area ambient temperature must not be less than -22°F [-30°C] and must not exceed +149°F [+65°C].

## 14.0 TROUBLESHOOTING

The information in the Troubleshooting Guide (Table 1) is intended as an aid to help diagnose and correct various possible problems that may occur.

For repair service, contact your nearest Enerpac Authorized Service Center. Only an Enerpac Authorized Service Center should be permitted to service the pump and its components.



**Failure to observe and comply with the following precautions could result in death or serious personal injury. Property damage could also occur.**

- Never tighten or loosen hydraulic fittings while the pump hydraulic system or connected components are pressurized. Escaping oil under pressure can penetrate the skin, causing serious personal injury.
- Keep hands, fingers and other body parts clear of pinch points and moving parts when observing operation during troubleshooting.
- To prevent accidental start-up of pump during servicing, always disconnect the pump from electrical power sources before performing any maintenance or repair procedures.

**Table 1 - Troubleshooting Guide**

Symptom	Possible Cause	Action
1. Pump will not start.	a. No power.	Be sure that the pump AC power cord is connected to the electrical outlet.
	b. Pump fault triggered.	Refer to Table 2, Pump Fault Codes, for additional information.
2. Pump stops under load.	a. Pump fault triggered.	Refer to Table 2, Pump Fault Codes, for additional information.
	b. Pump jammed due to obstruction.	Contact Enerpac Authorized Service Center.
	c. Pump bypass valve out of adjustment or malfunctioning.	Contact Enerpac Authorized Service Center.
	d. Internal damage to pump and/or motor.	Contact Enerpac Authorized Service Center.
3. Pump fails to build pressure or builds less than full pressure.	a. Low oil level.	Add oil to reservoir as required. Refer to Section 11.3 Follow priming procedure in Section 11.5 if pump reservoir was emptied during operation or while pump was being serviced.
	b. Relief valve open or set too low.	Raise relief valve pressure setting. Refer to Section 9.0.
	c. Oil needs changing.	Completely drain and refill reservoir per instructions in Section 11.4. <b>NOTICE</b> Use only Enerpac HF hydraulic oil. Use of other oils may result in damage to pump components and will void the Enerpac product warranty.
	d. External system leak.	Repair or replace components as required.
	e. Pump oil intake suction filter is dirty.	Contact Enerpac Authorized Service Center.
	f. Pump bypass valve out of adjustment or malfunctioning.	Contact Enerpac Authorized Service Center.
	g. Pump Internal leakage.	Contact Enerpac Authorized Service Center.
	h. Pump seals worn or damaged.	Contact Enerpac Authorized Service Center.
	i. Internal damage to pump and/or motor.	Contact Enerpac Authorized Service Center.

(continued on next page)

**Table 1 - Troubleshooting Guide (continued)**

<b>Symptom</b>	<b>Possible Cause</b>	<b>Action</b>
4. Low fluid output.	a. AC line voltage too low.	Low AC line voltage may result in lower motor speeds and reduced hydraulic output.
	b. External or internal system leak.	Repair or replace components as required.
	c. Pump needs priming.	Add oil to reservoir as required. Refer to Section 11.2. Follow priming procedure in Section 11.5 if pump reservoir was emptied during operation or while pump was being serviced.
	d. Bypass valve malfunction.	Contact Enerpac Authorized Service Center.
	e. Pump oil intake suction filter is dirty.	Contact Enerpac Authorized Service Center.
	f. Pump internal leakage.	Contact Enerpac Authorized Service Center.
	g. Pump seals worn or damaged	Contact Enerpac Authorized Service Center.
	h. Internal damage to pump and/or motor.	Contact Enerpac Authorized Service Center.
5. Torque wrench will not advance or retract.	a. Low oil level.	Add oil until reservoir is completely full.
	b. Relief valve setting is too low.	Increase relief valve setting. Refer to Section 9.1.
	c. Pump needs priming.	Follow priming procedure in Section 11.5 if pump reservoir was emptied during operation or while pump was being serviced.
	d. Pump oil intake suction filter is dirty.	Contact Enerpac Authorized Service Center.
	e. Internal damage to valve.	Contact Enerpac Authorized Service Center.
6. Torque wrench advances and retracts erratically.	a. Air in the system.	Advance and retract the torque wrench until operation is smooth. Refer to Section 7.3.
	b. External hydraulic leak.	Tighten connections. Replace damaged components.
	c. Internal leakage in valve.	Contact Enerpac Authorized Service Center.
	d. Internal damage to valve.	Contact Enerpac Authorized Service Center.
	e. Internal damage to pump.	Contact Enerpac Authorized Service Center.
7. Noisy pump operation.	a. Pump needs priming.	Refer to Section 11.5 for priming procedure.
	b. High oil flow over relief valve.	The user-adjustable relief valve may create a high pitched noise when relieving high oil flow.
	c. Relief pressure setting too close to pump bypass valve setting.	Avoid setting relief valve at the pump bypass setting of 3,000 psi [207 bar] whenever possible.
	d. Damaged and/or loose components inside pump, vibrating and/or making contact.	Contact Enerpac Authorized Service Center.
	e. Pump elements worn or damaged.	Contact Enerpac Authorized Service Center.
	f. Motor worn or damaged.	Contact Enerpac Authorized Service Center.
8. Pump runs hot.	a. Low oil level.	Check oil level with pump stopped and torque wrench retracted. Add oil if low. Refer to Section 11.3.
	b. Flow is restricted or blocked.	Check hydraulic couplers for full engagement. Check hoses for blockage or kinks.
	c. Oil flowing over the relief valve for long periods of time.	Reduce the amount of motor running time while oil is flowing over the relief valve.
	d. Pump air vents obstructed and/or pump cooling fins covered with dirt.	Clear any obstructions from pump cooling vents. Remove any dirt or dust from pump cooling fins.
	e. Low voltage.	Check AC line voltage. Pump can operate during a limited low voltage condition but overheating may result.

(continued on next page)

**Table 1 - Troubleshooting Guide (continued)**

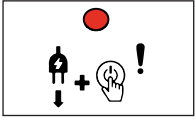
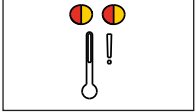
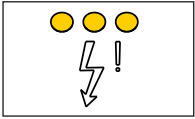
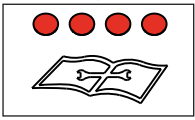
Symptom	Possible Cause	Action
9. Pendant LED indicator light flashes randomly at start-up. Pump does not operate when pendant buttons are pressed.	a. Service center diagnostic mode activated.	<p><b>NOTICE</b> The service center diagnostic mode can be accidentally activated if the pendant jog button is pressed down while the pump AC power cord is being plugged into the electrical outlet.</p> <p>If the pendant LED indicator light blinks randomly yellow or red/yellow, it indicates that the pump may be in diagnostic mode.</p> <p>To exit diagnostic mode, disconnect and reconnect AC electric power. Be sure no pendant buttons are being pressed as the pump AC power cord is being plugged into the electrical outlet.</p> <p>The pendant LED indicator light should appear solid green approximately 3 seconds after power has been reconnected. This indicates that the pump is in normal operational mode.</p>
	b. Pump electrical and/or mechanical problems.	Contact Enerpac Authorized Service Center.
10. Pump retract timer is extended (20 seconds) and the relief pressure is above 2,000 psi [138 bar].	Faulty or damaged pressure transducer.	Contact Enerpac Authorized Service Center.
11. Auto-cycle function is disabled and/or pendant will not accept a pressure setting.	a. Relief valve pressure setting is below 1000 PSI [70 bar].	Adjust relief valve pressure to 1000 psi [70 bar] or above. Auto-cycle operating pressure range is 1000 to 10,000 psi [70 to 700 bar].
	b. Faulty or damaged pressure transducer.	Contact Enerpac Authorized Service Center.
12. Pendant LED indicator light shows mechanical or electrical failure fault (see Section 15.0) when battery is connected to pump then changes to solid green after 10 seconds.	Faulty or damaged pressure transducer.	Contact Enerpac Authorized Service Center.



## 15.0 PUMP FAULT CODES (user-level)

Pump fault codes are displayed by the pendant LED indicator light.

- Refer to Table 2 for pump fault code information.
- See Figure 4 for location of pendant LED indicator light.

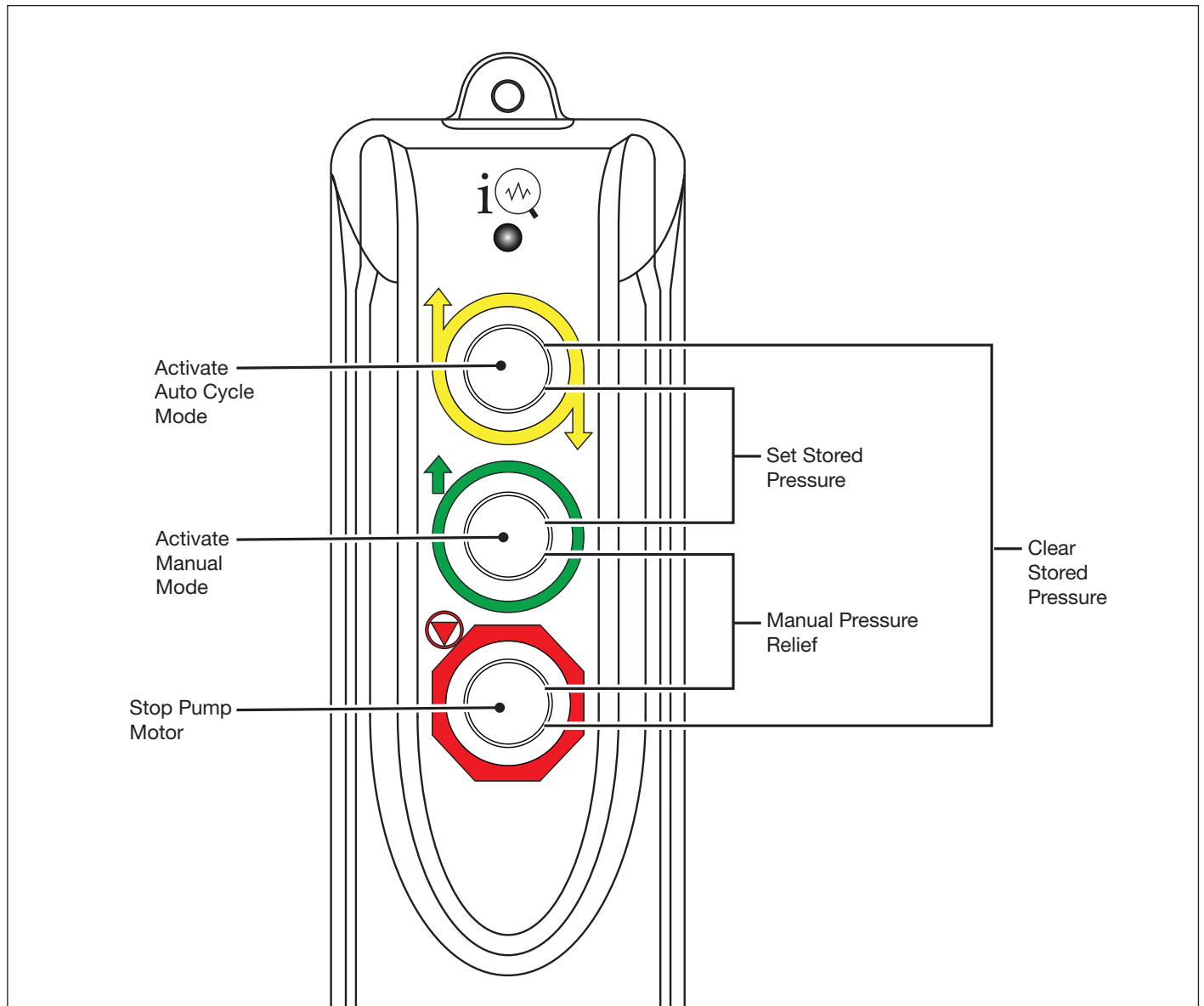
Table 2 - Pump Fault Codes (user-level)			
Fault	Pendant LED Indicator Light	Cause	Action
<p><b>BUTTON FAULT</b></p> 	<p>1 red blink followed by a 1 second pause. Sequence repeats until problem is corrected.</p>	<p>Pendant buttons pressed while AC power cord is connected to outlet.</p>	<ul style="list-style-type: none"> <li>• Disconnect power.</li> <li>• Ensure that pendant buttons are not being pressed.</li> <li>• Reconnect power and try to start pump again.</li> <li>• If problem persists, contact Enerpac Authorized Service Center.</li> </ul>
		<p>Damage to pendant and/or cable wiring.</p>	<p>Check pendant and pendant cable for obvious signs of damage or wear.</p> <p>Contact Enerpac Authorized Service Center if repairs are needed.</p>
<p><b>TEMPERATURE FAULT</b></p> 	<p>2 fast red/yellow blinks followed by a 1 second pause. Sequence repeats until pump cools to an acceptable temperature.</p>	<p>Motor, electrical or internal ambient temperature too high.</p>	<p>Allow time for pump temperature to decrease (as required).</p>
<p><b>VOLTAGE FAULT</b></p> 	<p>3 yellow blinks followed by a 1 second pause. Sequence repeats until problem is corrected.</p>	<p>Voltage above or below acceptable voltage range for your pump model.</p>	<p>Check AC power supply for correct voltage.</p>
<p><b>SERVICE REQUIRED FAULT</b></p> 	<p>4 red blinks followed by a 1 second pause. Sequence repeats until problem is corrected.</p>	<p>Mechanical or electrical failure.</p>	<p>Additional diagnostic procedures required to determine problem.</p> <p>Contact Enerpac Authorized Service Center.</p>

### Notes:

- The pendant LED indicator light will continue to repeat the fault code until the problem is corrected. A 1 second pause will occur in between the repeated fault codes.
- Pendant haptic pulses (vibration) will occur simultaneously when the LED indicator light begins flashing a fault code. After the LED indicator light has repeated the fault code 3 times, the haptic pulses will stop.

## 16.0 QUICK REFERENCE GUIDE - PENDANT CONTROLS

- Refer to Figure 11 for pendant quick reference guide.
- For some functions, two pendant buttons must be pushed simultaneously and/or in a sequence. Refer to sections 8.0 and 9.0 of this manual for detailed instructions.
- Pump must be connected to AC power. Pendant buttons are not functional when AC power is disconnected.



*Figure 11, Quick Reference Guide - Pendant Controls*









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