



Operation and Maintenance Manual

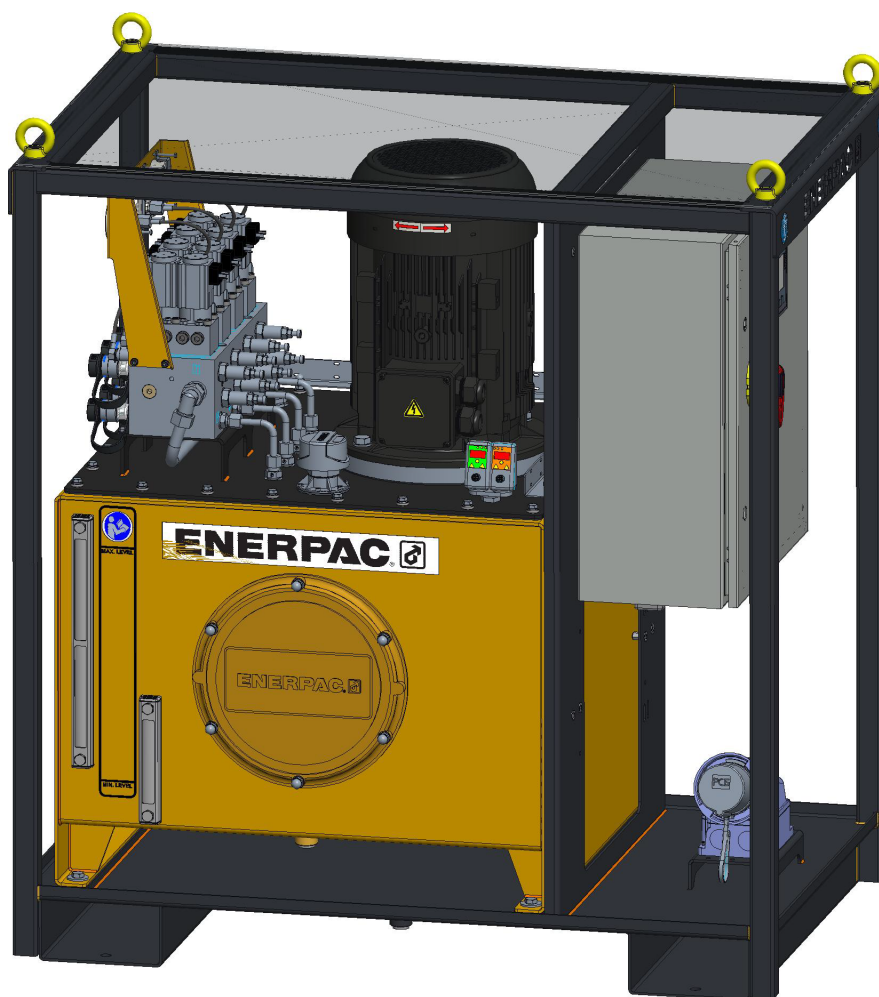
Enerpac SHP414S and SHP421S SyncHoist Pump (SHP)

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To reduce the risk of injury, user must read and understand this document before use.

ABOUT US

Enerpac is a global market leader in high pressure hydraulic tools, controlled force products, portable machining, on-site services and solutions for precise positioning of heavy loads. As a leading innovator with a 110-year legacy, Enerpac has helped move and maintain some of the largest structures on earth. When safety and precision matters, elite professionals in industries such as aerospace, infrastructure, manufacturing, mining, oil & gas and power generation rely on Enerpac for quality tools, services and solutions. For additional information, visit www.enerpac.com.



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WARRANTY

Refer to the Enerpac Global Warranty document for terms and conditions of the product warranty. Such warranty information can be found at www.enerpac.com.

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1. Safety

Read all instructions carefully. Follow all recommended safety precautions to avoid personal injury as well as damage to the product 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 that any questions or concerns arise, contact Enerpac or a local Enerpac distributor for clarification.

Save these instructions for future use.

If you have never been trained on high-pressure hydraulic safety, consult your distributor or service center for information about Enerpac Hydraulic Safety Courses.

This manual follows a system of safety alert symbols, signals, 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 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 DANGER, WARNING, CAUTION, and NOTICE.

⚠ DANGER Indicates a hazardous situation that, if not avoided, will result in death or serious personal injury.

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

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

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

1.1 Safety Precautions



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

- Read and completely understand the safety precautions and instructions in this manual before operating the SyncHoist System (SHS) or preparing it for use. Always follow all safety precautions and instructions, including those that are contained within the procedures of this manual.
- Always wear protective head-wear, ear protectors, footwear and gloves (at a minimum rigger type gloves) suitable for safe operation of the tool. The protective clothing must not interfere with safe operation of the tool or restrict the ability to communicate with co-workers.
- Be sure your workplace is safe. Follow the instructions in your workplace's standard operating procedures and be sure to observe all communicated safety precautions.
- Ensure all hydraulic components are rated to a safe working pressure of 700 bar (10,150 psi).
- Do not remove or disable the pump relief valve.
- The system operating pressure must not exceed the pressure rating of the lowest rated component in the system.
- Never set a relief valve to a higher pressure than the maximum rated pressure of the SHS. If ratings are different, relief valve setting should not exceed the setting of the lowest rated component (pump or cylinder).
- Do not overload equipment. Never attempt to move a load weighing more than the capacity of the SHS. Overloading causes equipment failure and possible personal injury.
- Always perform a visual inspection of the SHS before placing it into operation. If any problems are found, do not use the cylinder. Have the cylinder repaired and tested before it is returned to service.
- Never use a cylinder that is leaking oil. Do not use the SHS if it is damaged, altered or in need of repair.
- Always lift the cylinder using a crane or other suitable lifting device of sufficient rated capacity.

- Allow only trained and experienced personnel to supervise and perform lifting and lowering procedures.
- Be sure the operator has completed safety induction training, specific to the work surroundings. The operator should be thoroughly familiar with the controls and the proper use of the tool.
- Be certain that no persons are working on or near the SHS before moving of the load begins. Alert all personnel in advance that the procedure is about to occur.
- Lift only dead weight loads. Avoid lifting live weight loads.
- Be especially careful when lifting loads such as partially filled storage tanks, in which the center of gravity could move or shift during lifting. Be aware that the distribution of some loads can change quickly and without warning.
- Keep all personnel clear of the work area while lifting or lowering is in progress. To avoid personal injury, keep hands and feet away from cylinder and load during operation.
- Maintain communication with the operator at all times during lifting or lowering to avoid accidents. Use hand signals, two-way radios or other appropriate forms of communication (as required by applicable laws and regulations) if the load is not visible to the operator.
- Operate SHS as required to ensure that the load is moved evenly and at a controlled rate.
- Closely watch the load at all times during the moving process. Stop immediately if the load becomes unstable or appears to be moving unevenly.
- Always be certain that hydraulic pressure is fully relieved and that the load is fully removed from the SHS before disconnecting hydraulic hoses, loosening hydraulic fittings, or performing any cylinder disassembly or repair procedures.
- Any components that are blocked or stuck in any way (and any parts connected to these components) will be under mechanical tension. If you release these parts, they could change position suddenly and cause serious injury could result.

⚠ CAUTION

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

- Be careful to avoid damaging hydraulic hoses. Avoid sharp bends and kinks when routing hydraulic hoses. Do not exceed the minimum bend radius specified by the hose manufacturer. 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.
- Ensure components are protected from external sources of damage, such as moving machine parts, sharp edges, weld spatter, corrosive chemicals and excessive heat or flame.

- 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 break.
- Keep hydraulic equipment away from flames and heat. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings.
- For optimum performance, do not expose hydraulic equipment to temperatures of 150°F [65°C] or higher. 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 product to malfunction.
- To prevent damage to pump electric motor, check specifications. Use of incorrect power source will damage the motor.
- Any modifications to the SHS could cause a dangerous situation and void the warranty.
- Keep the hydraulic and moving components clean to prevent the SHS from jamming or causing damage to itself or other equipment.
- Switch the power off before inspection, maintenance or repair of the SHS. Make sure that the relevant parts are no longer receiving power. If possible, make a connection to earth. Insulate any adjacent components that are still receiving power.
- If work does need to be performed on components receiving power, then a second person must be present in the area to switch off the main power switch in the event of an emergency. Cordon off the work zone and only use certified and properly insulated tools.
- Lubricate tools as directed in this manual prior to operation. Use only approved lubricants of high quality, following the lubricant manufacturers instructions

NOTICE

Failure to observe and comply with the following precautions could result in property damage and/or void the product warranty.

- Always use Enerpac pumps and hoses.
- Always use Enerpac replacement parts.
- Always follow the inspection and maintenance instructions contained in this manual. Perform maintenance and inspection activities at the specified time intervals.

2. Compliance Statement

2.1 Conformance to National and International Standards

- SHP414SJ •SHP414SW
- SHS421SJ •SHP421SW



These tools conform with the requirements for CE and UKCA.

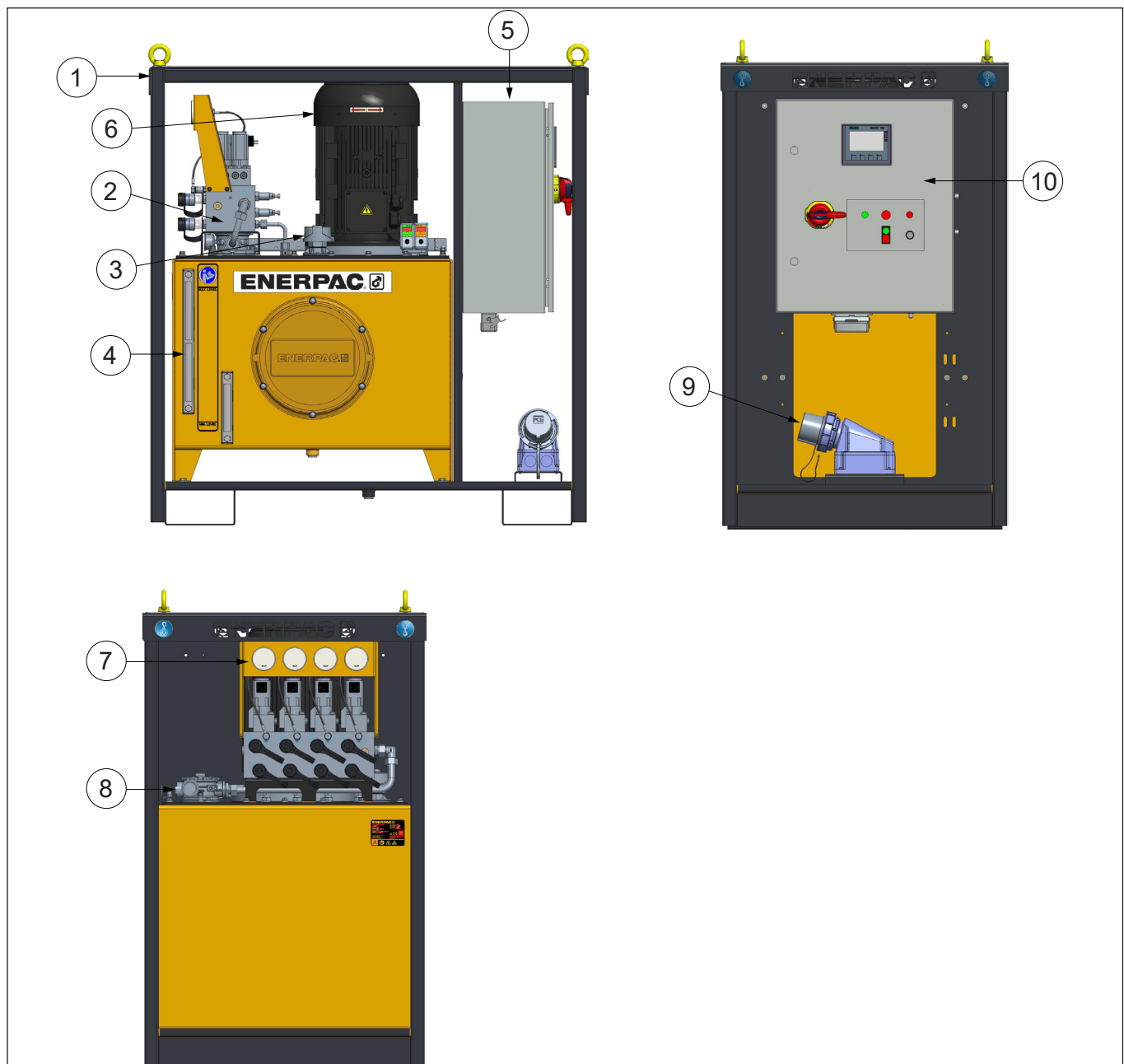
Enerpac declares that these product(s) have been tested and conforms to applicable standards and the product(s) are compatible to all EU and UK Requirements.

Copies of the EU Declaration as well as the UK Self-Declaration are enclosed with each shipment.

3. Features & Components

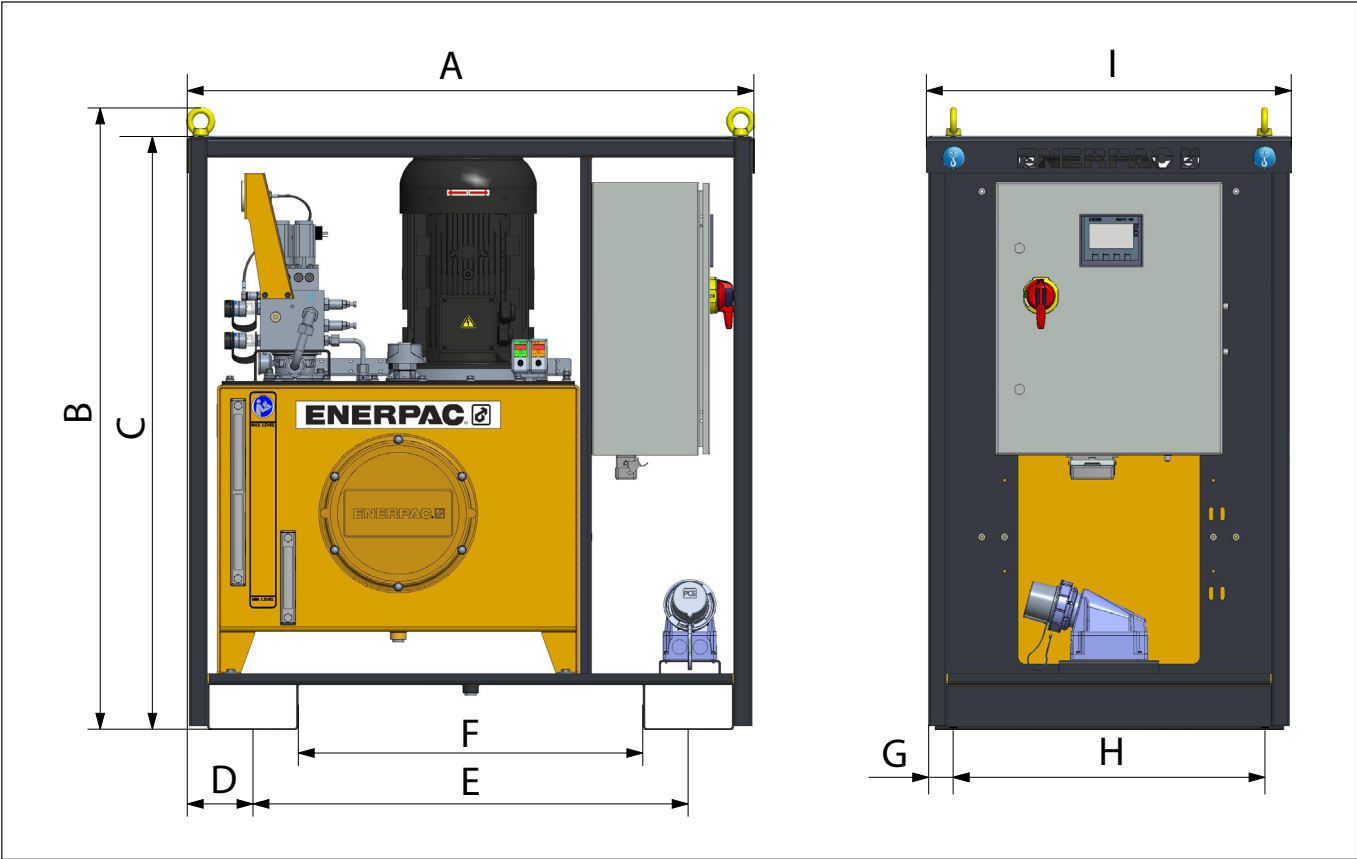
3.1 SyncHoist Pump (SHP)

- | | |
|-----------------------|-----------------------|
| 1. HPU Frame | 6. Main Motor |
| 2. Control Manifold | 7. Pressure Gauge (4) |
| 3. Oil Filling Cap | 8. Return Filter |
| 4. Visual Level | 9. Power Plug |
| 5. Electrical Cabinet | 10. Control Panel |



4. Product Technical Data

4.1 SHP Dimensional Diagram



4.2 SHP Dimensional Table

Measurement	SHP414SW/SJ SHP421SW/SJ	
	mm	in
A	1250	49.21
B	1370	53.96
C	1307	51.48
D	145	5.71
E	960	37.80
F	760	29.92
G	54	2.13
H	688	27.09
I	805	31.69

4.3 SHP Capabilities

Features	SHP414SW	SHP414SJ	SHP421SW	SHP421SJ
Flow	1.4 L/min	1.7 L/min	2.1 L/min	2.5 L/min
Motor Power	7.5 kW	9.0 kW	11.0 kW	12.7 kW
Power Supply	3 ph/400 V/50 Hz	3 ph/460 V/60 Hz	3 ph/400 V/50 Hz	3 ph/460 V/60 Hz
Max. Pressure	700 bar			
Reservoir	250 L			
Weight	780 Kg			
Oil Grade	ISO VG 32			

4.4 SyncHoist Sytem Description

Enerpac SyncHoist Pump (SHP) is designed for use as part of the Enerpac SyncHoist System (SHS). SHS is a unique crane product for below-the-hook positioning of heavy loads that require precision placement.

The SHS is composed of a SHP used in tandem with four SyncHoist Hydraulic Cylinders (SHC), which are specialized hydraulic cylinders that have an internally mounted distribution block. The SHC's are connected to the SHP allowing precise monitoring and adjustment for each lifting point independently.

The SHP includes an integrated touchscreen (HMI) and pendant to work in local mode. HMI allows setting the parameters of the system and the cylinder movements are controlled with the pendant buttons. Load, position and pressure readings are shown in the HMI.

Automatic control is available connecting a Single Synchro Control Box (SFPSSC) to the SHP. All configurations and controls are available from the SFPSSC in remote mode. Refer to L4904 for remote mode operation.

The system is designed for 10150 psi [700 bar] maximum working pressure.

5. Installation

5.1 Handling

The HPU can be lifted with a crane, holding it by the lifting points on top of the frame.

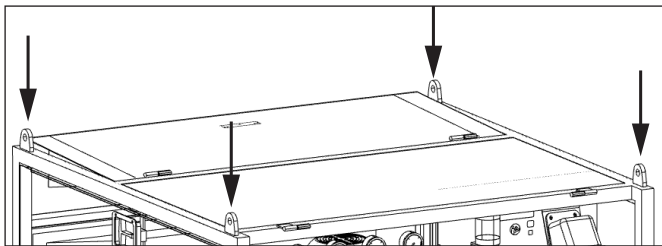


Figure 1: Lifting points

5.2 Hydraulic Oil Requirements

Use of Enerpac HF Series ISO 32 hydraulic oil is recommended. Enerpac HF oil is available at your local Enerpac Distributor or Authorized Service Center.

NOTICE

- Failure to use the correct oil type (high-quality ISO 32 hydraulic oil) may result in damage to cylinder hydraulic components and will void the product warranty.
- Be sure that the oil is clean. The oil cleanliness should be maintained to a maximum level of 18/16/13 per the ISO4406 standard. If the oil develops a milky, cloudy or dark appearance, it should be changed immediately.
- To avoid overfilling and possible equipment damage, add oil to the pump reservoir only after all synchoists are completely retracted and system pressure is released.
- When using a hand-operated pump to power the cylinder(s), it is permissible to use a high-quality brand of ISO 15 hydraulic oil. The lower oil viscosity will result in reduced pumping effort, especially in cold weather conditions.

5.3 Hydraulic Connections

It is not necessary to start-up the SHP to connect the SHC.

Connect the hoses with the SHC retracted and in horizontal position. If the SHC are in vertical position, it may be difficult to connect the hose in the small chamber due to the pressure created by plunger weight.

Connect the hydraulic hoses as follows:

- Port A (SHC female coupler) is connected to the retract port A (SHP male coupler).
- Port B (SHC male coupler) is connected to the extend port B (HPU female coupler).

Perform the following steps to correctly connect the hoses:

1. Remove dust covers / rubber plugs from oil ports.
2. Inspect all threads and fittings in search of wear or damage signs and replace as needed.
3. Clean all threads and fittings.
4. Make hydraulic connections for double-acting cylinders using two hoses.
5. Fully hand-tighten all couplers.

CAUTION

Make sure all couplers are fully tightened. If the hose cannot be fully tightened, ensure that there is no pressure trapped inside. Release pressure from the hose if needed.

CAUTION

Loose coupler connections will block the oil flow oil between the SHP and the SHC.

Check for leaks in system and have them repaired by qualified personnel.

CAUTION

Extend and retract the cylinders a few centimetres before installing the cylinders under the hook. Enerpac recommends to do this check while cylinders are located in the transport structure. Check all cylinders for leakage.

5.4 Electrical Connections

The SHP is factory equipped with a 3 phase electrical plug for the given voltage, altering the plug type should only be done by a qualified electrician, adhering to all applicable local and national codes.

The plug supplied will vary, depending on voltage and motor size:

Motor Size		Electric Plug
7.5 kW	10 hp	3Ph + N + PE 400V 16A
11 kW	14.75 hp	3Ph + N + PE 400V 32A

The disconnection and line circuit protection will be provided by the customer. Line circuit protection is 115% of motor full load current at maximum pressure of application.

Connect the pressure transducers and stroke sensors to the SHP with a cable from the SHC sensor connection port to the sensor connectors on the side of the SHP electrical cabinet.

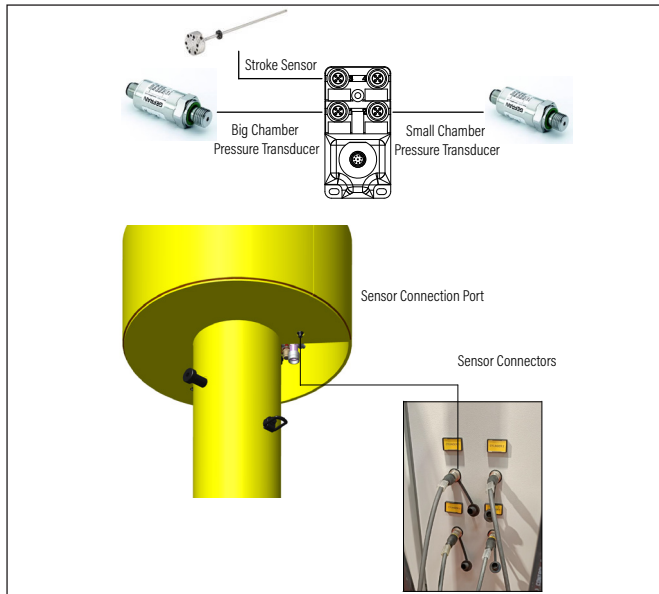


Figure 2: Sensors connection layout

5.5 SHP Electrical Cabinet

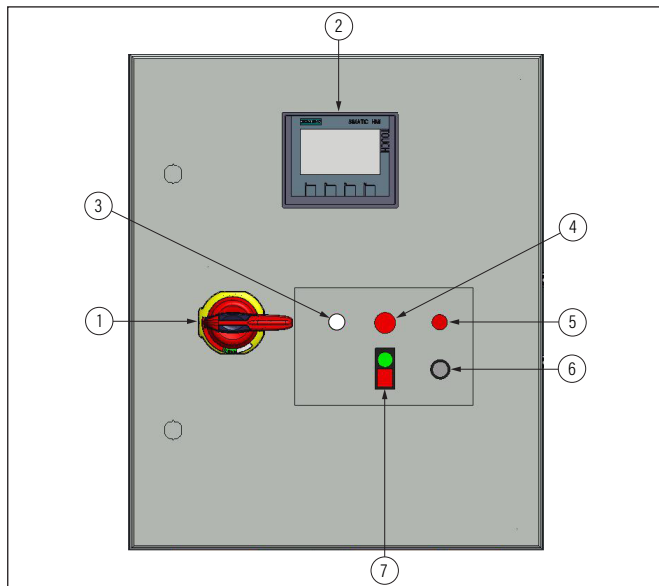


Figure 3: SHP Electrical Cabinet

1. Main switch: turn right to switch on and left to switch off.



Turn off the main switch to open the electrical cabinet door.

2. HMI: Displays SHC parameters and allows to set up the manual movement.
3. Power light: White light when main switch is turned on.
4. Emergency pushbutton: Push in case of emergency to stop the system immediately. Active both in local and remote mode.

5. Reset alarms button: Turns on when an alarm comes up: yellow light for warning alarms or red light for stop alarms. Push the button to reset the alarms.
6. Local / Remote Key Switch: Turn the key to select the SHS control mode, local or remote.

NOTICE

It is necessary to connect an SFPSSC for remote mode.

NOTICE

The key can only be inserted and removed in remote mode.

7. Start / Stop motor buttons: Push to start or stop the motor.

5.6 Pendant Control

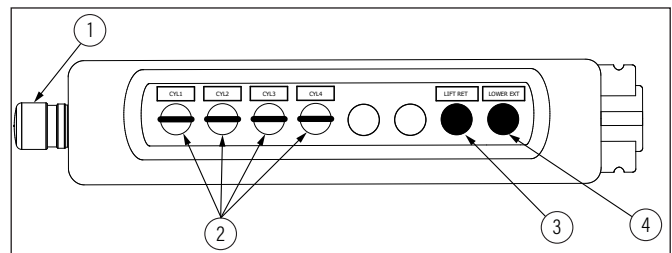


Figure 4: Pendant Control

1. Safety pushbutton: Push in case of emergency to stop the system immediately. Only active in local mode.
2. Cylinder selection switches: Turn to select the corresponding cylinder.
3. LIFT RET pushbutton: Push and hold to retract the selected cylinders and lift the load.
4. LOWER EXT pushbutton: Push and hold to extend the selected cylinders and lower the load.

6. Screens

6.1 Initial Screen

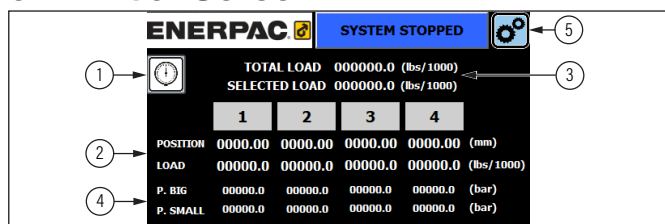


Figure 5: Initial Screen

The initial screen shows the data for all system cylinders:

1. Pressures Activation: Enables and disables the pressures readings (Item 4).
2. Position and Load: Shows the position and load of all system cylinders.
3. Total / Selected Load: Shows the total load of all cylinders and the load of the selected cylinders in the pendant.
4. Pressure: Shows the pressure of all system cylinders. It is shown in the screen as P. Big, which is the pressure inside the big chamber, and P. Small which is the pressure inside the small chamber. Only available with pressures enabled.
5. Configuration: Push this button to open the configuration pop-up screen.

6.2 Configuration Pop-up Screen

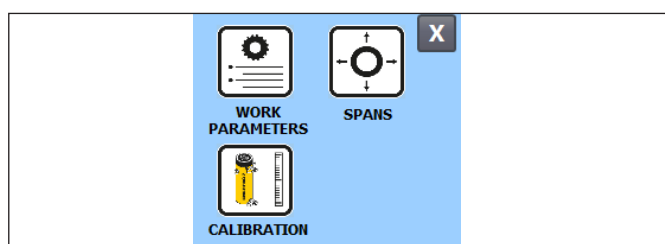


Figure 6: Configuration Pop-up Screen

The screen shows 3 buttons: Work Parameters button, Spans button and Calibration button to access to each screen.

6.3 Work Parameters Screen

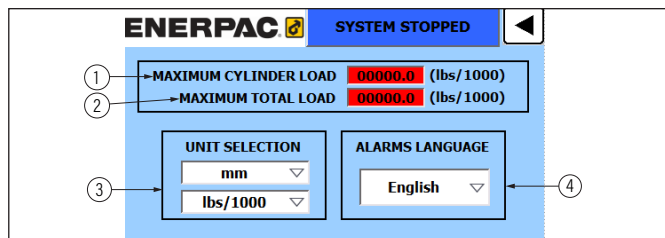


Figure 7: Work Parameters Screen Details

1. Maximum Cylinder Load: Enter the maximum load expected for each cylinder. If this value is exceeded a warning alarm is displayed (Refer to Section 12, Alarms List). This alarm is triggered whether the cylinder is selected or not.



Maximum Cylinder Load must be set according to the load to be lifted, not to the SHC lifting capacity.

2. Maximum Total Load: Enter the maximum load expected for the cylinders involved in the current application. If this value is exceeded, the system stops the movement and a stop alarm is displayed (Refer to Section 12, Alarms List).

NOTICE

The parameter Maximum Cylinder Load is checked against each cylinder Load value in the initial screen (Refer to Section 7.1, Item 2) and the parameter Maximum Total Load is checked against Total Load value in the initial screen (Refer to Section 7.1, Item 3).

3. Units Selection: The user can select the system units:
 - Length units: mm or inches.
 - Load units: lbs/1000, Ton (1000 kg), s Ton (907,18 kg) and kN.
4. Alarms Language Selection: Select the alarms language.

6.4 Spans Screen

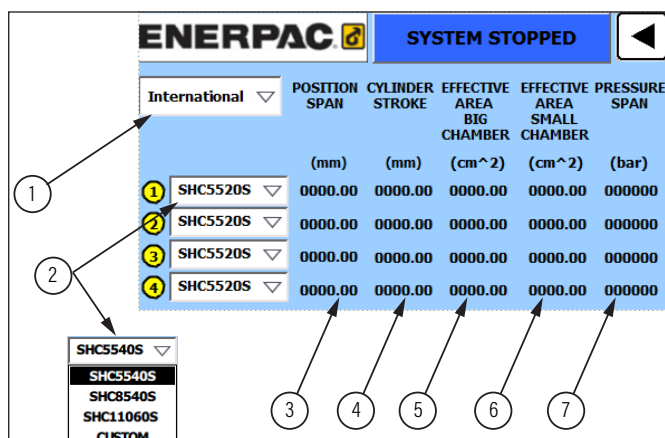


Figure 8: Spans Screen Details

In this screen the user must select the appropriate SHC through the drop-down menu.

1. Units button: Select the system units: International System of Units (Metric) and Imperial System of Units (Imperial).
2. SHC Drop-Down Menu: Choose the SHC from the standard ones or custom. If the user selects a standard model, all values are loaded automatically. If custom is selected, the system allows the user to input the specifications of the custom cylinder, from item 3 to item 7.

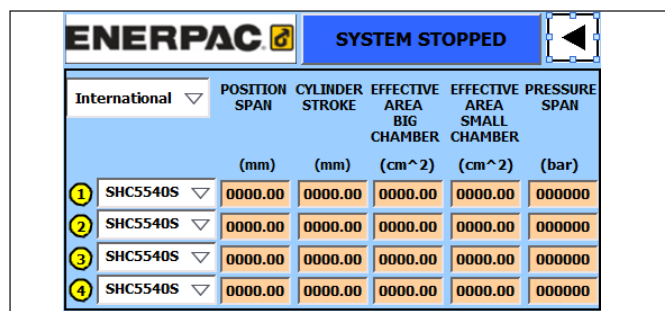


Figure 9: Spans Screen Custom Cylinder

3. Position Span: Shows the maximum length of the stroke sensor installed on the selected SHC.

4. Cylinder Stroke: Shows the maximum stroke of the selected SHC.
5. Effective Area Big Chamber: Shows the effective area of the piston chamber.
6. Effective Area Small Chamber: Shows the effective area of the rod chamber.
7. Pressure Span: Shows the maximum capacity of the pressure transducer.

6.5 Calibration Screen

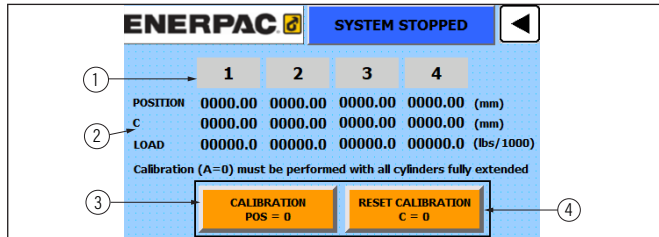


Figure 10: Calibration Screen Details

Calibration process allows to have the same reference between plunger position and internal sensor stroke.

Calibration process must be performed with all cylinders fully extended to set that position as the zero position in the system. Thus, positive increments in position mean that the load is being lifted (the cylinder retracts) and negative increments in position mean that the load is being lowered (the cylinder extends).

1. Cylinder Selection: Shows the cylinders selected in the pendant. When a cylinder is selected, the button becomes orange.
2. System Values:
 - Position: The absolute position is the position of the cylinder plunger taken from the initial zero. This initial zero is set when Calibration button is pressed with the cylinder fully extended.
 - C (Calibration value): The calibration value is a memory variable that stores the absolute position when calibration is performed.
 - Load: This value shows the load being withstood by each cylinder in the current moment.
3. Calibration Button (POS=0): Press and hold for 3 seconds to convert the reading of the stroke sensor to 0 mm (fully extended cylinder calibration) and store this value in variable C.

NOTICE

Calibration must be performed with cylinders fully extended.

4. Reset Calibration Button (C=0): Press and hold for 3 seconds to reset the calibration (variable C takes the value 0 mm). Position (POS) shows the reading of the stroke sensor.

6.6 Remote Mode Active Screen

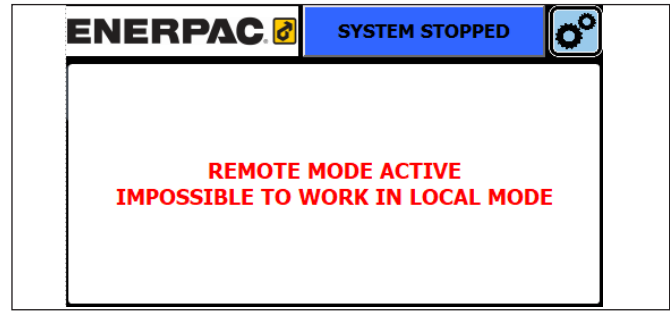


Figure 11: Remote Mode Active Screen

When the remote mode is selected, this screen shows up in the SHP HMI.

7. Operation

7.1 Switching On the System

1. Perform a visual check of hoses and cylinders, ensuring they are not bent and they are in the correct position.
2. Make sure that hose plugs are correctly inserted in.
3. Check the oil level with cylinders fully retracted.
4. Check that the safety stop pushbuttons are released.
5. Turn on the main switch. Check the power light in the SHP electrical cabinet.
6. Check for alarms in the control. If any alarm comes up, check and solve the root cause and push the reset alarm button in the electrical cabinet.
7. Start the motor in the SHP.

8.3 Calibration Procedure

NOTICE

Calibration must be performed with cylinders fully extended.

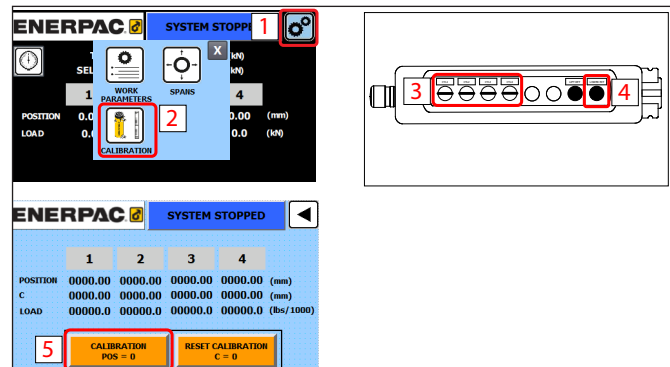


Figure 12: Calibration Procedure

1. Go to Configuration.
2. Go to Calibration mode.
3. Select the cylinders to be calibrated.
4. Push and hold the lowering/extend pushbutton until the cylinders are fully extended.
5. Press and hold the calibration button for 3 seconds.

NOTICE

If there is any error while calibrating the cylinders, press and hold reset calibration button for 3 seconds. Repeat the previous steps to restart the calibration procedure.

8.4 Manual Mode

⚠ WARNING

Be sure the operator has completed safety induction training, specific to the work surroundings. The operator must be familiar with the controls and the proper use of the tool.

⚠ WARNING

Keep all personnel clear of the work area while lifting or lowering is in progress. Alert all personnel before any operation.

⚠ CAUTION

Make sure the setup is stable and check all hydraulic connections before any operation.

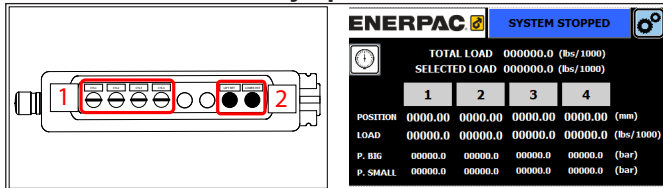


Figure 13: Manual Mode Procedure

1. Select the cylinders to be moved.
2. Push and hold the lifting/retract or lowering/extend button to move the selected cylinders to the desired position.
- Check the SHC readings during the movement in the HMI. Pressures are only available by pressing pressure button.

8.5 Switching Off the System

1. Stop the motor in the SHP.
2. Turn off the main switch.

9. Maintenance & Inspection

In order to keep the SHS in a good working condition, good quality maintenance is required. Periodic preventive inspection and maintenance are necessary to keep SHS in good operating condition at all times. The early recognition and elimination of minor irregularities and immediate replacement of worn and damaged parts will help prevent downtime, associated costs and safety issues.

9.1 Modifications

- Perform the prescribed maintenance tasks at the prescribed times and observe the details regarding the replacement of components.
- If modifications to the machine are performed without the manufacturer's permission, the warranty becomes invalid.

⚠ WARNING

Any Modifications to the SHS could cause a dangerous situation.

NOTICE

Only use Original Equipment Manufacturer (OEM) parts. Failure to use OEM replacement parts may void the warranty. Enerpac cannot assume responsibility for damage or injury resulting from use of non-OEM replacement parts.

9.2 Safety During Maintenance

The following instructions are general safety rules for maintenance personnel:

1. The operator must familiarize with the system and its operating procedures.
2. Do not perform maintenance work unless you are authorized to do so. Unauthorized personnel must not work on the SHS.
3. Observe all safety and warning signs on the SHS.
4. Observe all safety instructions contained in this manual.
5. Observe the applicable safety regulations when working with inflammable fluids.
6. Perform maintenance work only after the motors have been switched off. Always ensure that the SHS is protected from unauthorized operation before beginning maintenance work.
7. Be sure the hydraulic system is despressurized, before starting maintenance operations at the hydraulic system.
8. In some cases, maintenance needs to be carried out on motors, and other components during operation. This task must only be carried out by trained personnel. Specialized personnel must always supervise the work on the system in these cases.
9. Do not spill lubricants / oil, etc. Be aware of the environment and the cost of cleaning up.
10. Ensure that all PPE's and other safety equipment are used when operating conditions demand it.
11. Be aware of fire alarms. Know the location and operation of fire extinguishers.
12. Only use appropriate workshop equipment. Prevent damage to parts using unsuitable equipment.
13. No modifications, additions or conversion work that could affect the safety of the equipment must be carried out. This applies also to the fitting and adjustment of safety devices, covers, valves and welding supporting parts.
14. Spare parts must conform the specified technical requirements of the manufacturer.
15. Return the system to proper working conditions once maintenance work is completed. Inform the operator accordingly.

9.3 Responsibilities

Maintenance work and inspections must only be performed by trained and qualified personnel. In most cases, maintenance can be performed by the operator.

For the following maintenance work, however, the manufacturer must be contacted:

- Hydraulic equipment pressure settings adjustment.
- Hydraulic pumps adjustment and repair.
- Control valves of all main functions adjustment and repair.
- Electrical system adjustment and control system repairs.
- Welding, cutting, grinding or any other structural adjustment work.

- Main parts replacement.
- Additional maintenance work not written in this manual.



It is the customer responsibility to maintain the system regularly for durability and to keep it in good working conditions.

9.4 General Maintenance Procedure

Before, during and after maintenance, the following procedures are applicable:

1. Procedures prior to maintenance work.
 - Let powerpacks cool down. When working on the electrical system or welding on the work site, shut down the powerpack and remove all electric connectors.
 - Maintain the work area and equipment clean. Use the appropriate cleaning materials for the items to be cleaned.
2. Procedures during maintenance.
 - Perform inspection / maintenance work according to the table and fill in the maintenance form.
 - Use all required PPE's.
 - Use technical competence and tools suitable for the job.
3. Procedures after maintenance.
 - Return system to proper working condition.
 - Check all components for leaks.
 - Fit safety devices and carry out operational checks on the system.

9.5 SHP Maintenance

9.5.1 Check Oil Level

Check oil level of SHP prior to start-up with cylinders fully retracted. If necessary, add oil by removing the oil filling cap (Refer to Figure 5, Item 3).

NOTICE

Always make sure SHC are fully retracted before adding oil to the reservoir.

9.5.2 Change Oil and Clean Reservoir

Enerpac HF oil is a crisp blue color. Frequently check oil condition for contamination by comparing pump oil to new Enerpac oil. Replace oil and return filter cartridge when return filter is clogged.

Enerpac recommends to completely drain and clean the reservoir every 250 hours, or more frequently if used in dirty environments.

NOTICE

Work on a clean bench and dispose of used oil according to local codes.

1. Unscrew the front lid to access inside of the reservoir.
2. Pour all oil out of the reservoir.
3. Thoroughly clean the reservoir and reservoir magnet with a suitable cleaning agent.
4. Restore the front lid in the reservoir.
5. Remove the bleeder screw. Refer to paragraph 9.3

for further information.

6. Fill the reservoir with clean Enerpac hydraulic oil.
7. Leave the pump two hours quiet to purge the air.
8. Reinstall and tighten the bleeder screw.

9.5.3 Bleeding the Pump

The pump has to be bled prior to initial operation and after every fluid service to prevent intake problems and air to be fed into the hydraulic system. The coupling must not get in contact with the pressure fluid:

1. Remove the bleeder screw (located on the cover plate beneath the dipstick or the breather) prior to filling the tank.
2. Fill the reservoir and leave the bleeder screw open.
3. Turn on the pump for 15 seconds and turn off again.
4. Repeat the previous point 5 times or until the fluid without bubbles comes out.
5. The fluid must come out without bubbles when the complete air is purged.
6. Reinstall and tighten the bleeder screw.

9.5.4 Return Filter Cartridge Replacement

The filter cartridge should be replaced every 250 hours or more frequently in dirty environments.

The filter is equipped with a 25 psi (1,7 bar) bypass to prevent over pressure rupture if filter plugging occurs and with a small gauge that shows the pressure when the filter is dirty.

9.6 Hoses maintenance

In order to maintain hoses in a good condition, follow the next steps:

1. Keep below the maximum permitted pressure. Ensure that peak pressures do not exceed the maximum allowed pressure.
2. Do not drop heavy objects or stand on pressurized hoses.
3. Do not pull on connected hoses. If pulling forces are exerted on a hose, hydraulic couplings could weaken, which may result in bursting of the hose out of the coupler.
4. Do not bend hoses too tightly. Do not exceed the bending radius permitted by the manufacturer.
5. Change worn or damaged hoses immediately. Do not use dirty or corroded couplers.
6. Do not expose hoses to temperatures higher than 150°F [65°C].

10. Hydraulic Schemes

10.1 SHP414SW

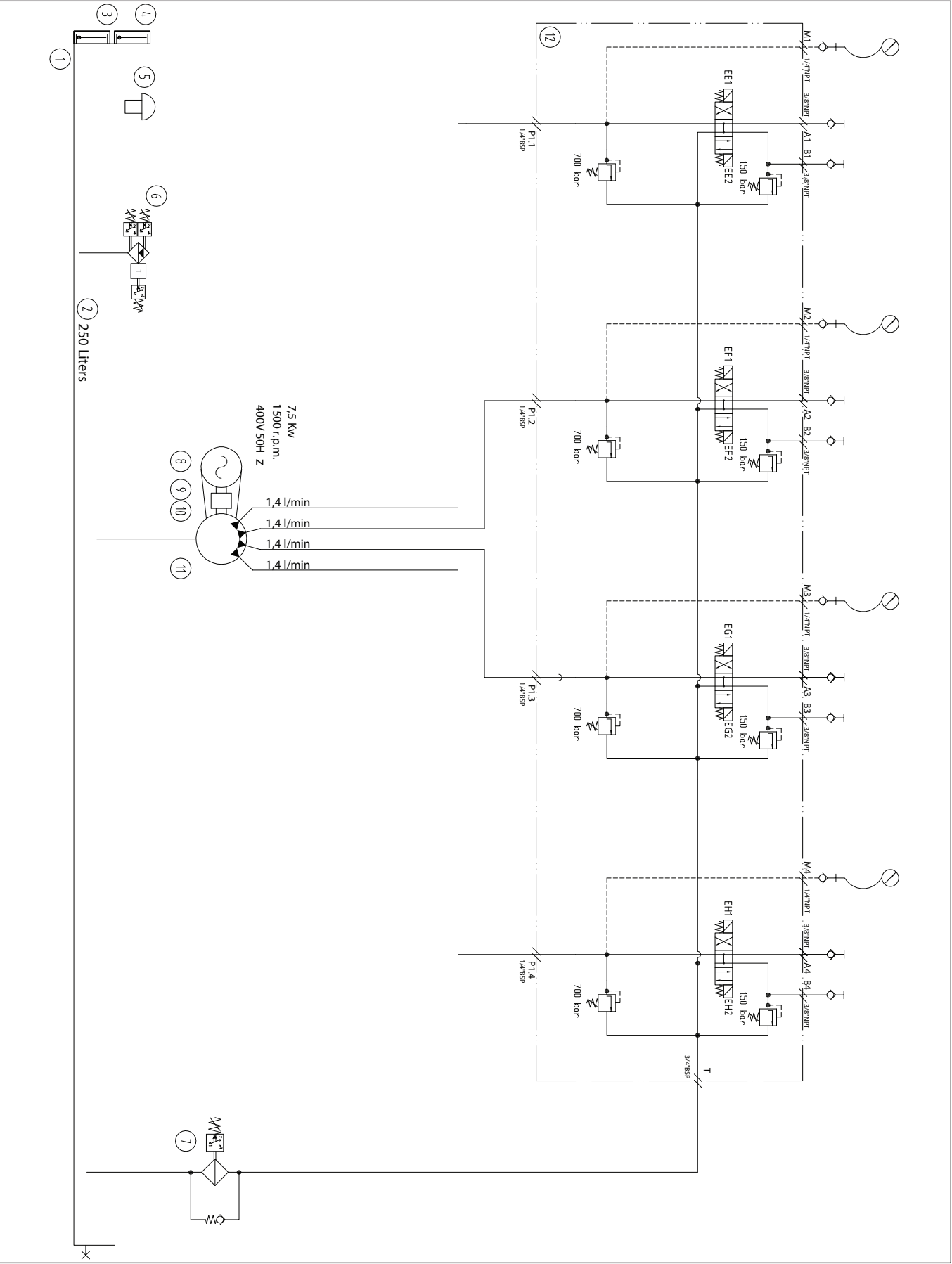


Figure 14: SHP414SW Hydraulic Scheme

10.2SHP414SJ

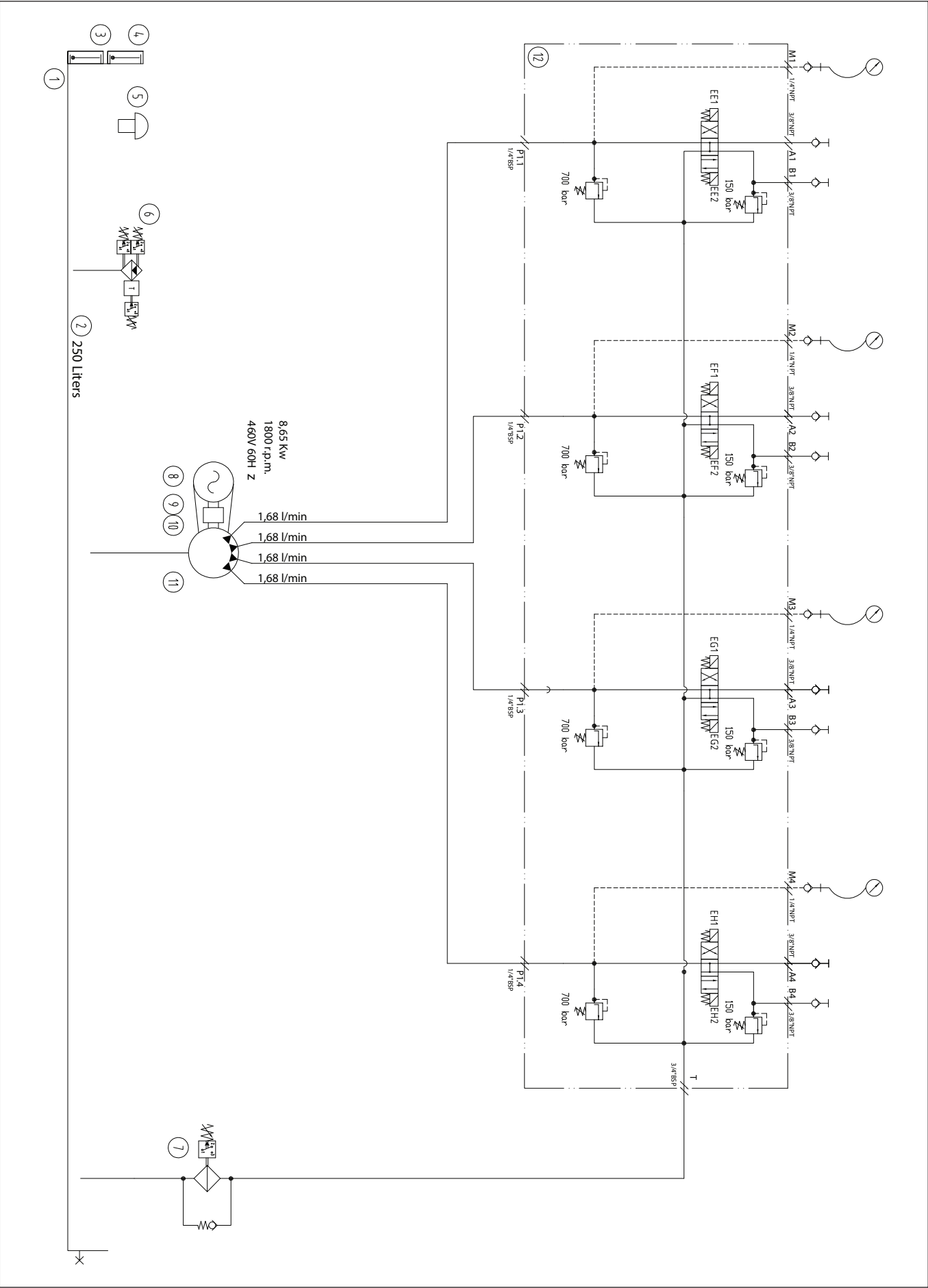


Figure 15: SHP421SW Hydraulic Scheme

10.3SHP421SW

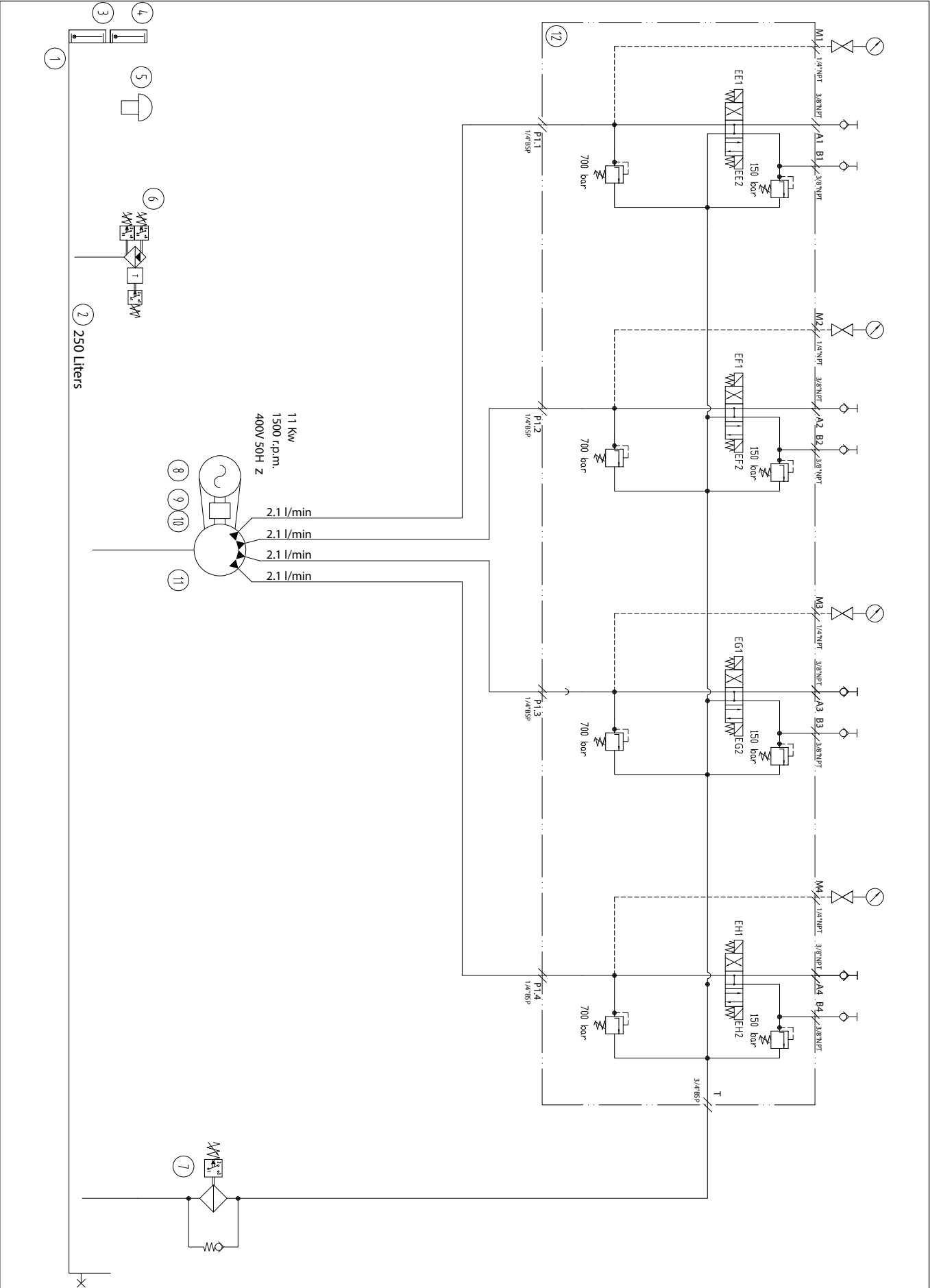


Figure 16: SHP421SW Hydraulic Scheme

10.4SHP421SJ

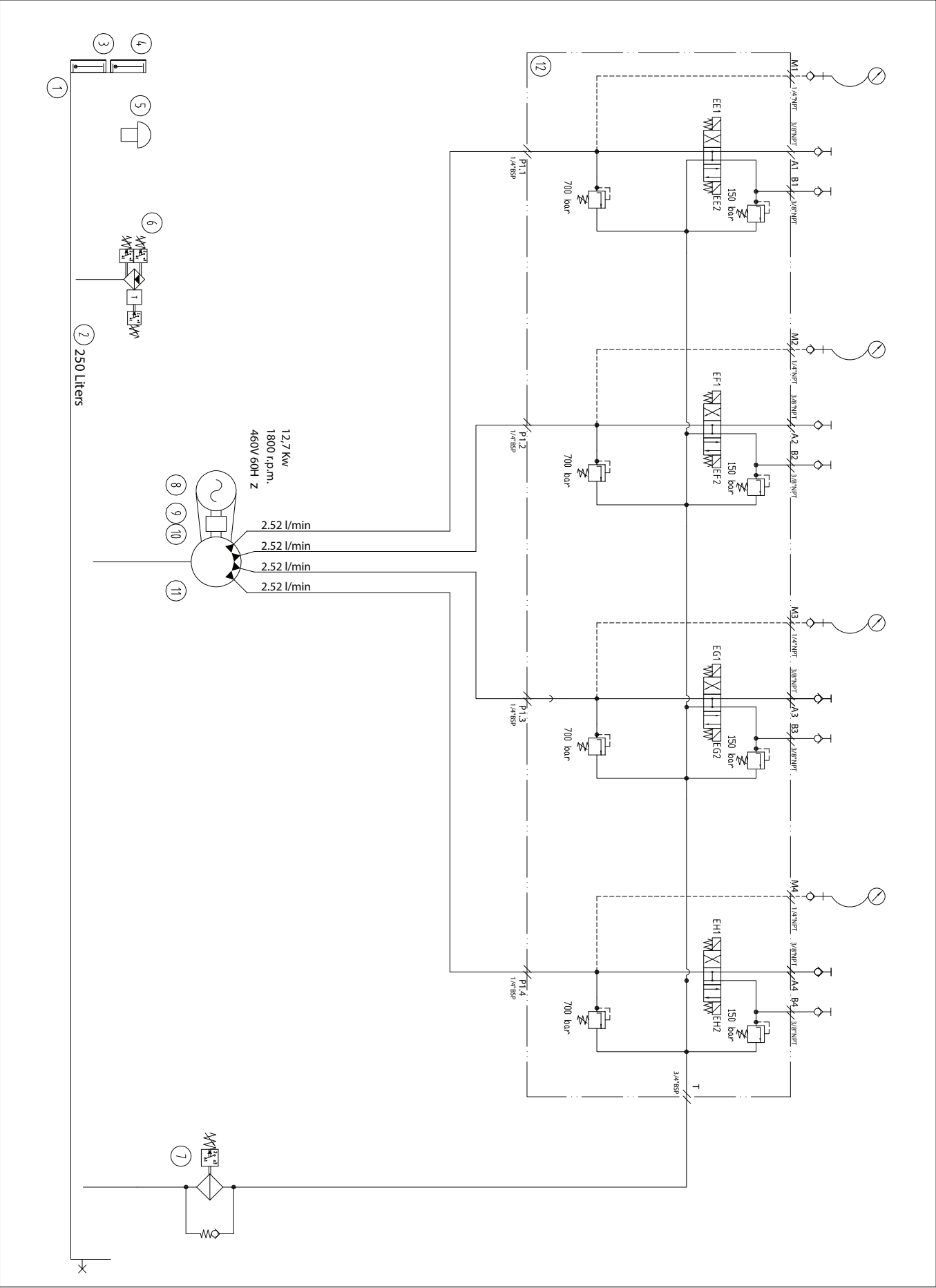
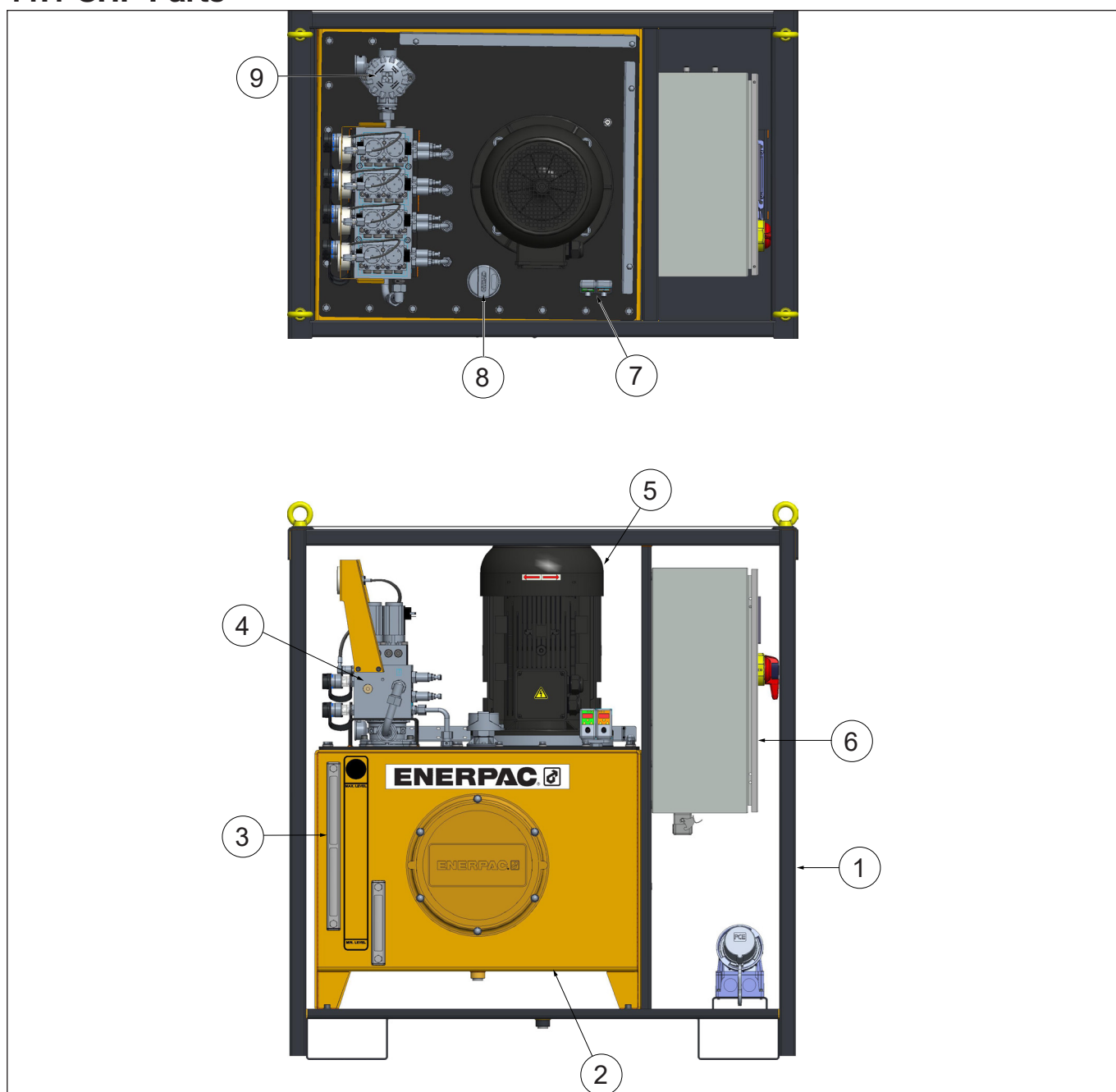


Figure 17: SHP421SJ Hydraulic Scheme

11. Parts List

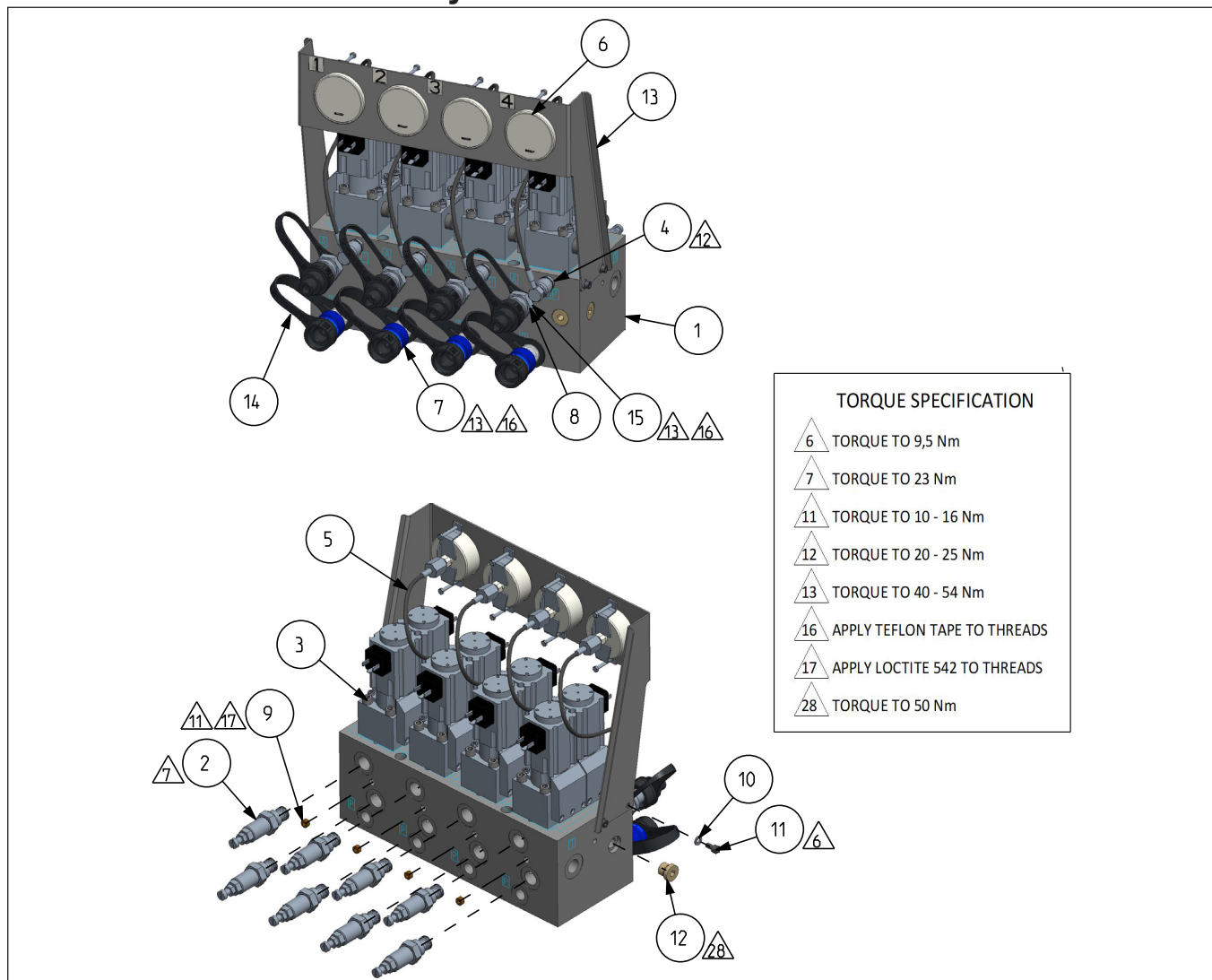
11.1 SHP Parts



11.1.1 SHP Table of Parts

Item N.º	Description	Qty.	Part Number	
			SHP414SW/SJ	SHP421SW/SJ
1	HPU Frame	1	DB0113201-99	
2	Reservoir	1	DB0154025	
3	Oil Level	1	DB4734022	
4	Manifold Assembly	1	DB9642900	
5	Electric Motor	1	DB4607034	DB4621259
6	Electric Cabinet	1	N/A	
7	Electronic Temperature and Oil Level	1	DB4203022	
8	Breather Filter	1	DB4368118	
9	Return Filter	1	DB4604175	

11.2 SHP Manifold Assembly



11.2.1 SHP Manifold Assembly Table of Parts

Item N.º	Description	Qty.	Part Number
1	Manifold	1	DB5167840
2	Safety Valve	8	DB1062663
3	Directional Valve	4	DB1311660
4	Minimess Coupler NPT 1/4"	4	DB2904034
5	Mnimess Hose	4	DB4737646
6	Pressure Gauge	4	DB4736223
7	Female Coupler	4	DB1389900
8	Hose Half Male	4	DB1392900
9	Flush Plug	4	A1007245
10	Flat Washer	4	CAE1060108-1A
11	SHCS Screw M6x12	4	CBA617028-1A
12	BSP Plug 3/8"	3	DB2140006
13	Support for Pressure Gauges	1	DB9642900-1
14	Dust Cap	8	DD1782020
15	Nipple	4	FZ1617

12. Alarms List

Only qualified hydraulic technicians should service pump or system components. System failure may or may not be the result of a pump malfunction. To determine the cause of the problem, the complete system must be included in any diagnostic procedure.

Refer to the alarm chart for a list of alarms and possible causes. The alarm chart is not all-inclusive, and should be only considered as an aid to help diagnose the most common problems. For repair service, contact Authorized Enerpac Service Center.

ALARMS CHART			
ALARM	TYPE	POSSIBLE CAUSE	SOLUTION
Motor OFF.	S	A movement has been attempted with the motor powered off.	- Reset the alarm. - Start the motor.
Synchronization Alarm. (Remote Mode)	S	In Tilting mode, the Deviation value is bigger than the Stop Tolerance parameter in a single cylinder.	- Check the Stop Tolerance parameter. If it is incorrect, change it. - If it is correct, reset the alarm and continue the cycle. - If the alarm is occurs again, visually check the cylinder. - Check delta values to be sure they are not too exaggerated (e.g. Delta 1: 2 mm / Delta 2: 1000 mm)
Maximum Total Load.	S	The total sum of cylinder loads (selected and non-selected) has exceeded the value entered in the "Maximum Total Load" parameter.	- Check the parameter, considering the load weight and the cylinder characteristics. If it is incorrect, change it. - Check the cylinder model in spans screen. - If "Maximum Total Load" parameter is correct, the load weight is bigger than the theoretical value expected in the application. Ask to the engineer about it. - Reset alarm. The alarm only can be reset by entering a parameter bigger than the Maximum Total Load.
Soft Starter Failure	S	The motor could not be started correctly and the soft starter goes to error.	- Check the motor phases. - Make sure the tension is correct. - Visually check the cables. - Reset alarm.
Pump Inlet Valve Closed		This alarm indicates that the Inlet valve is close and the oil does not flow.	Open the inlet valve and reset the alarm
Safety stop pendant (Local Mode) Safety Stop cabinet Safety Stop controller (Remote Mode)	S	Each alarm shows depending on the working mode.	Rearm the Stop button and reset the alarm
Maximum Cylinder (#) Load.	W	The load withstand by the cylinder (#) has exceeded the entered value in Maximum Cylinder Load parameter.	- Check the parameter, considering the load weight and the cylinder characteristics. If it is incorrect, change it. - Check the cylinder model in spans screen. - Reset the alarm. It only can be reset by entering a parameter bigger than the previous cylinder load.

Cylinder (#) Big Chamber Pressure Signal Failure.	W	The pressure transducer signal of indicated (#) cylinder big chamber is not reaching the PLC.	- Visually check the pressure transducer and the cable. - Reset alarm.
Cylinder (#) Small Chamber Pressure Signal Failure.	W	The pressure transducer signal of indicated (#) cylinder small chamber is not reaching the PLC.	- Visually check the pressure transducer and the cable. - Reset alarm.
Cylinder (#) Stroke Signal Failure.	W	The stroke sensor signal of indicated (#) cylinder is not reaching the PLC.	- Visually check the stroke sensor cable. - Reset alarm.

NOTES

[illegible]

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[illegible]

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[illegible]

