ENERPAC

Operation and Maintenance Manual

Enerpac EVO System
Synchro Lifting Pump

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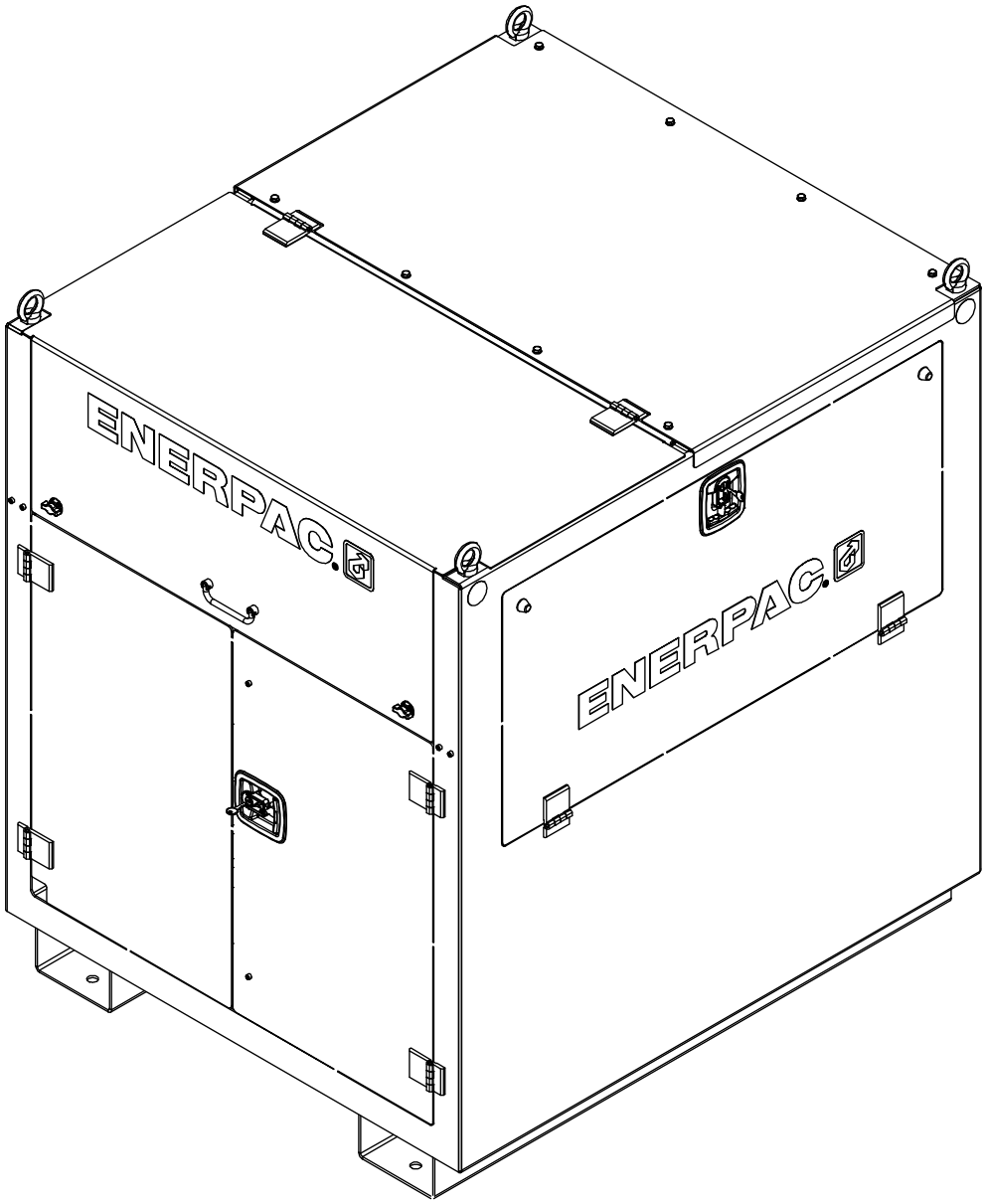

⚠ To reduce the risk of injury, user must read and understand this document before use.

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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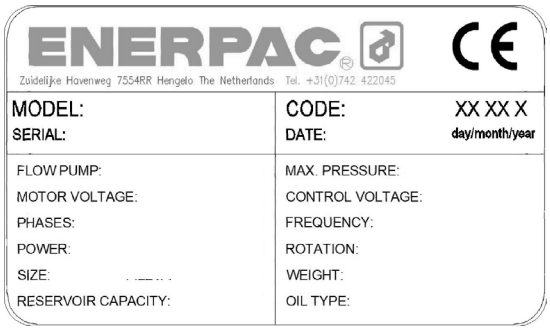
WARRANTY

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.

NAMEPLATE



AVAILABLE LANGUAGES

L4528 is available in the following languages, visit www.enerpac.com for a copy.

- Weitere Sprachen finden Sie unter www.enerpac.com.
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Contents

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 this signal word.

1.1 Safety Precautions

⚠ WARNING

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 safety precautions and instructions in this manual before operating an EVO pump or preparing it for use. Always follow all safety precautions and instructions, including those that are contained within the procedures of this manual.
- If alternative hydraulic pumps are used, ensure that there are adequate systems to limit the working pressure to 700 bar (10,150 psi).
- Wear personal protective gear when operating hydraulic equipment. Always wear eye protection. Safety equipment such as dust mask, non-skid safety shoes, hard hats, gloves or hearing protection (used as appropriate) will reduce personal injuries.
- Immediately replace worn or damaged parts. Use only genuine Enerpac parts from approved distributors or service centers. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.
- To minimize risk of personal injury keep hands and feet away from the tool and work piece during operation.
- 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.
- Do not leave the pump unattended in the workplace while it is connected to a 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 power outlet, the power must be turned off and locked out at the power supply.
- Always disconnect the pump from the power supply before transporting it.
- Be sure that the pump is powered off before removing plug from electrical outlet.
- Do not unplug the pump by pulling on the cord, instead pull on the plug.
- Remove plug from electrical outlet when the pump is not in use and before servicing or cleaning the pump.
- 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 does 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.
- If the pump has to be reconnected on a different type of electric circuit, the reconnection should be done by a qualified electrician. After the reconnection, the pump should comply with all local codes and ordinances.

⚠ CAUTION

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

- 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. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 65°C [150°F] or higher.
- Do not use electric pumps in an explosive atmosphere. Adhere to all local and national electrical codes. A qualified electrician must perform installation and modification.
- Take care to avoid sharp bends and kinks in hydraulic hoses. Bends and kinks can cause severe back-up pressure and cause hose failure. Protect hoses from dropping objects; a sharp impact may cause hoses internal damage. Protect hoses from crush risks, such as heavy objects or vehicles; crush damage can cause hose failure.
- Do not lift hydraulic equipment by the parts which are not designated to that purpose. Use only designated carrying handles.
- Avoid situations where loads are not directly centered across the entire saddle surface. Off-center loads produce considerable strain on cylinders and plungers. In addition, the load may slip or fall, causing potentially dangerous results.
- To prevent damage to pump electric motor, check specifications. Use of incorrect power source will damage the motor.
- 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.

- Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the nearest Enerpac Authorized Service Centre.
- To help ensure proper operation and best performance, the use of Enerpac oil is strongly recommended.

2. Compliance Statement

2.1 EU Declaration of Conformity

•EVO421380 •EVO440380 •EVO821380
•EVO840380 •EVO1221380 •EVO1240380
•EVO421460 •EVO440460 •EVO821460,
•EVO840460 •EVO1221460 •EVO1240460

CE UKCA

These tools conform with the requirements for CE and UKCA.

Enerpac declares that these products have been tested and conforms to applicable standards and the products 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

1. Electric Motor
2. Air Filter
3. Electric Cabinet
4. Electric Plug
5. Lifting Eyes
6. Peripheral Connectors
7. Advance Manifold
8. Return Manifold
9. Reservoir
10. Reservoir Lid
11. Siren Beacon
12. Digital Level and Thermo Sensor
13. Breather Filter / Oil Filling Cap
14. Return Filter
15. Distribution Manifold

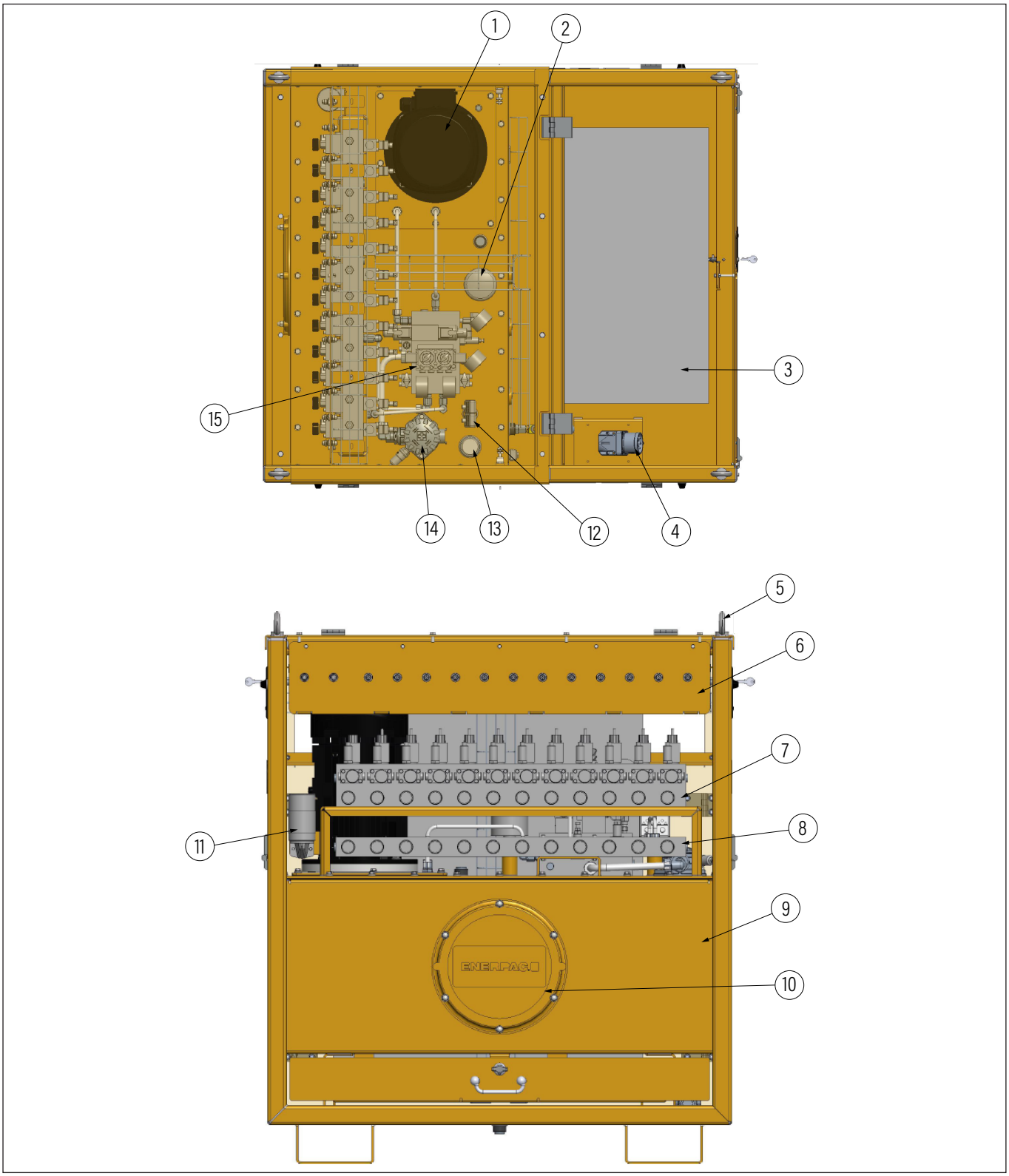

Figure 1: Major components of the EVO System

4. Technical Product Data

4.1 Dimensional Call out Art

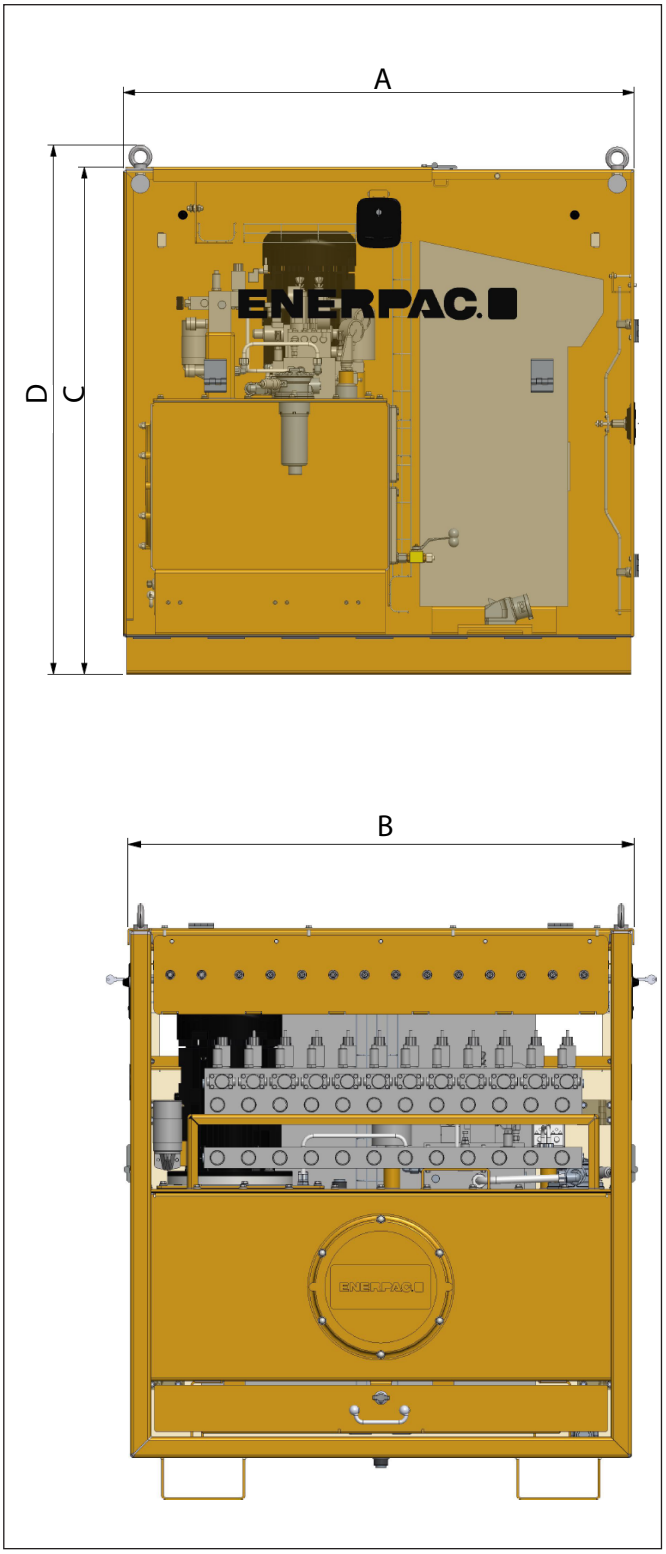

Figure 2: EVO System general dimensions

4.2 Dimensional Table

Measurement	mm	in
A	1375	54.13
B	1211	47,67
C	1367	53.81
D	1426	56.14

4.3 EVO System Description

The EVO System pumps are an ideal solution for multi-point lifting and lowering applications where uneven loads need to be positioned equal and synchronously. They are a far better alternative to using separately operated pumps or manifolds with needle valves.

The load can be lifted/lowered using single or double-acting cylinders or even pulling cylinders. Depending on the application, the lifting points can be individually or simultaneously operated in a synchronized mode.

With the EVO System, the user can make synchronous movements with 4 up to 12 cylinders depending on the model being used. Also has built in warning and stop alarms for optimum safety.

The application possibilities are infinite with the EVO System, such as powering interlinked hydraulic cylinders (single or double-acting), pushing or pulling cylinders, stage lifting, hollow plunger or lock nut cylinders. The EVO system has 10 work modes. The operator can navigate to any of these work modes: Manual, Pre-Load, Automatic, Tilting, Stage Lift, Depressurize, Fast Retract, Weighing, COG and Load Graph.

4.4 Equipment Accuracy

The EVO System accuracy depends on some features such as pump oil flow (2.1 or 4.0), the speed parameter (100% or 30%), number of cylinders being synchronised at the same time (2 up to 12) and the lifting capacity of the cylinders (5 Ton or 800 Ton).

Using lower oil flow, low cylinder speed, and a high number of connected cylinders with great capacity, the system can reach a 0.5 mm accuracy.

In general use, equipment accuracy is about 1 mm, but this fact could vary according to the features previously explained.

4.5 EVO Pumps Capabilities

Model Number	Lifting points	Oil Flow at 50 Hz (l/min)		Motor Size (kW)	Weight (Kg)
		<150 bar	>150 bar		
EVO421380	4	11.1	2.1	3.0	910
EVO421460					
EVO440380	4	13	4.0	7.5	1005
EVO440460					
EVO821380	8	11.1	2.1	3.0	910
EVO821460					
EVO840380	8	13	4.0	7.5	910
EVO840460					

Model Number	Lifting points	Oil Flow at 50 Hz (l/min)		Motor Size (kW)	Weight (Kg)
		<150 bar	>150 bar		
EVO1221380	12	11.1	2.1	3.0	920
EVO1221460					
EVO1240380	12	13	4.0	7.5	1025
EVO1240460					

Motor Speed	Inverter	
Frequency	15-50 Hz	
Power Supply	380-415 VAC - 3PH + GND (-380 EVOs) 400-480 VAC - 3PH + GND (-460 EVOs)	
Control Voltage	24 VDC	
Max. Pressure	700 bar	10,150 psi
Reservoir	250 L	66.04 gal

4.6 EVO Control Description

The control is placed on top of the electric cabinet and it has the following elements:

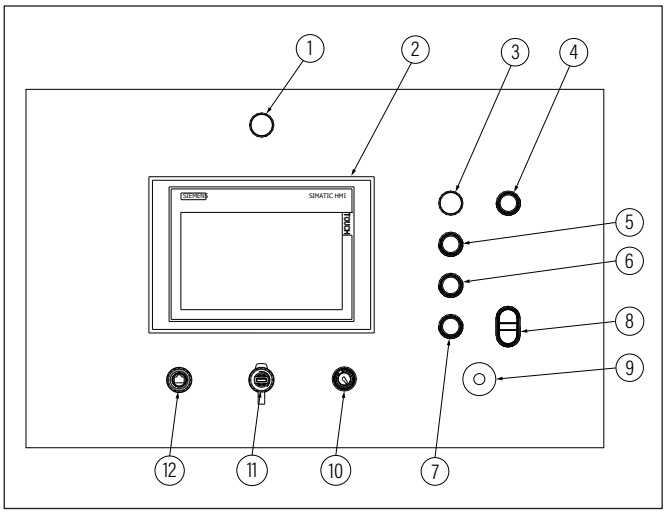

Figure 3: Components of the control panel

1. Power light: This light shows the cabinet is correctly connected to a power source.
2. Touch screen: With this screen the user can control the system and set the different work parameters.
3. System OK light: This light will be on, when the system is connected, with no alarms and ready to work.
4. Reset alarms button: The operator can push this button to reset the system alarms once the reason of the alarms has been solved.
5. Start Cycle button: This button starts any movement in which cylinders are involved. In manual mode this button must remain holded to continue the movements. In all other modes, pressing it once will start the movement.
6. Pause Cycle button: In automatic movements, use this button to stop temporarily the movement. The work values (Position, pressure, etc...) will be kept in the system until the movement is resumed. To resume the movement push the Start Cycle button.
7. Stop Cycle button: Pressing this button during the movement will fully stop the cycle or work process.
8. Start / Stop Motor button: Pushing these buttons, will switch the EVO motor On/Off.
9. Emergency button: Push this button in an emergency case. The system will be stopped immediately.
10. Local / Remote Key Switch: The user must introduce and turn the key to change the EVO control mode. In local mode, the user commands the EVO using the control panel above the electrical cabinet. In remote mode, the EVO is commanded with an EVO controller (CLNC12). Refer to instruction manual L4476 for further information about this controller. The key will only come out of the switch in remote mode due to security purposes.
11. Ethernet connection: For service connection only. (Used by Enerpac Service Centre for troubleshooting or software update).
12. USB connection: A USB drive can be connected in this plug to save the position values and load readings of every cylinder during the movements.

5. Installation

5.1 Transportation

The frame has two forklift pockets for lifting, and four hoisting certified eyes for lifting with cranes.

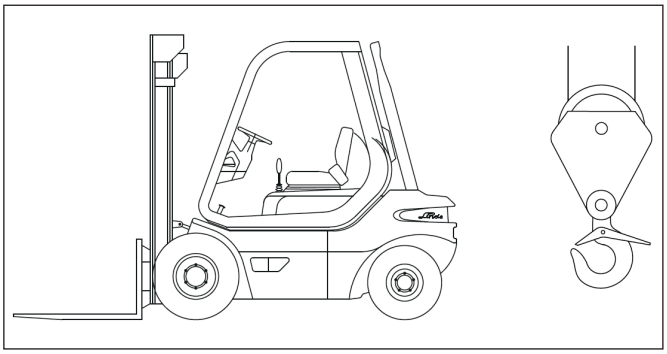

Figure 4: Equipment suitable for transportation

5.2 Protector Frame

The EVO system has been designed with a protector frame with hinged lids which are need to be opened to operate with the system.

NOTICE

The hinged lids must be always opened when system is working for ventilation and oil refrigeration purpose. For transportation, the hinged lids must be always closed.

5.3 Electric Connections

Each stroke sensor must be associated to one cylinder. That cylinder must be connected to an oil output in the pump, therefore each cylinder will have a number associated to the output and hence each stroke sensor will have the same number of the cylinder associated accordingly.

The stroke sensor cable must be connected to the electric plug associated to the number of the cylinder.

The electric plugs for the stroke sensors are placed in the rear side of the pump. Refer to the Figure 5 to see the connectors for the stroke sensors.

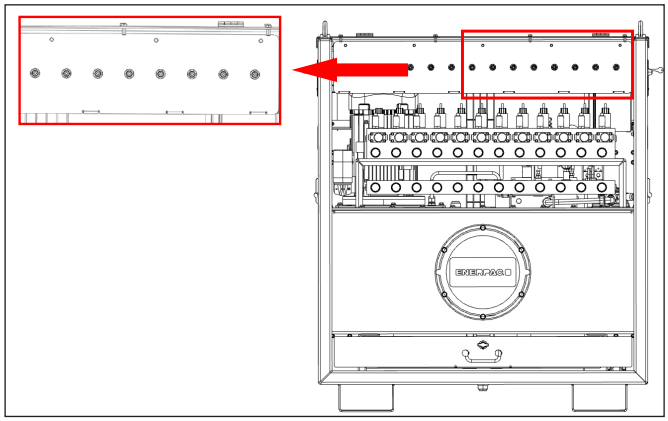

Figure 5: Detail of the plugs for the stroke sensors

Connect the pump to the electric power source. The pump has been designed to connect to a power source with the following features:

- 380-415 VAC - 3PH + GND (-380 EVOs)
- 400-480 VAC - 3PH + GND (-460 EVOs)

The electric connector is placed in the front side of the pump.

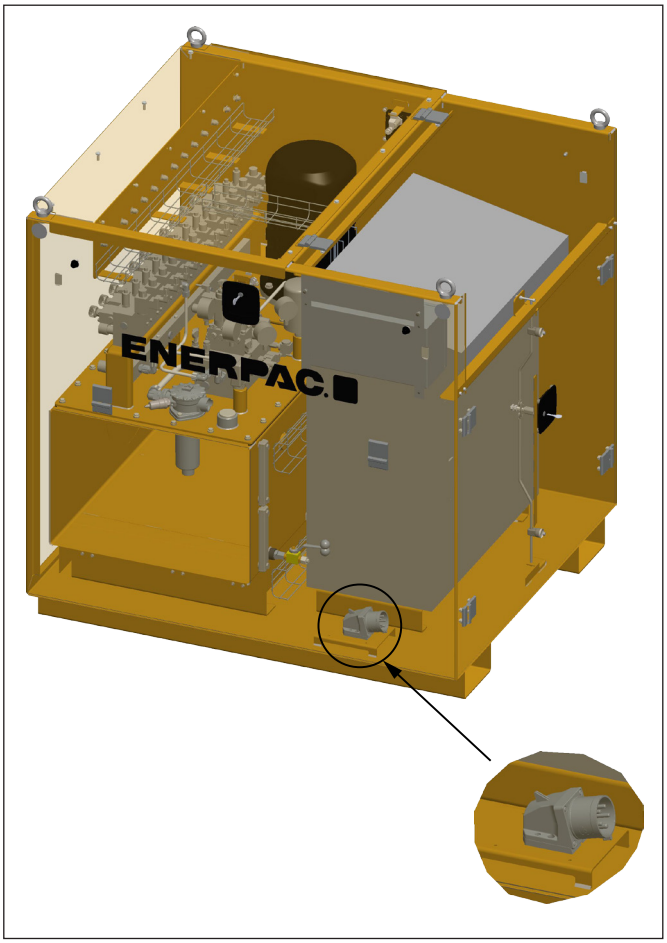

Figure 6: Electric plug layout

5.4 Hydraulic Connections

The EVO system can be connected to double or single acting cylinders. Refer to Figure 7 for a visual description of hydraulic connections of cylinders for general purposes.

The basic standard is to connect the working chamber to the A output, and the return oil chamber to the B output .

Each cylinder must be numbered with a unique number corresponding with the output where has been connected. The output in the A line and in the B line must match and must be connected to the same double acting cylinder.

NOTICE

It is mandatory that the operator has a full understanding of all instructions, safety regulations, cautions and warnings, before starting to operate high force tool equipment. In case of doubt, contact Enerpac.

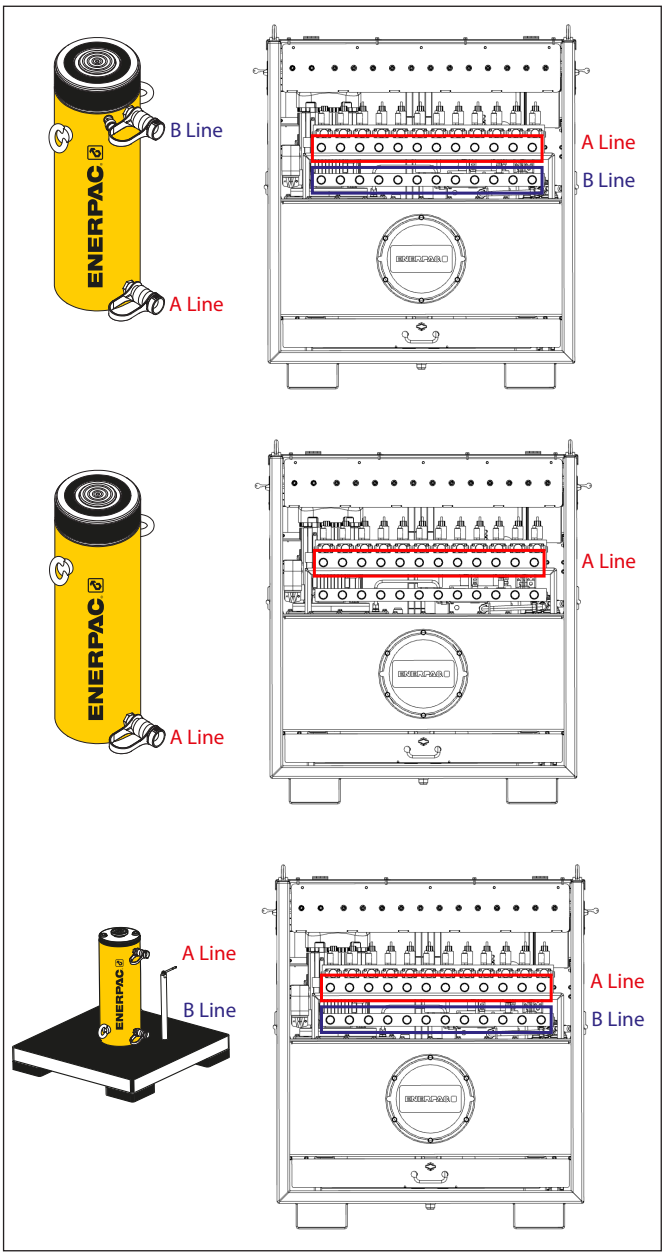

Figure 7: Hydraulic connection layout

6. Screens

6.1 Initial Screen

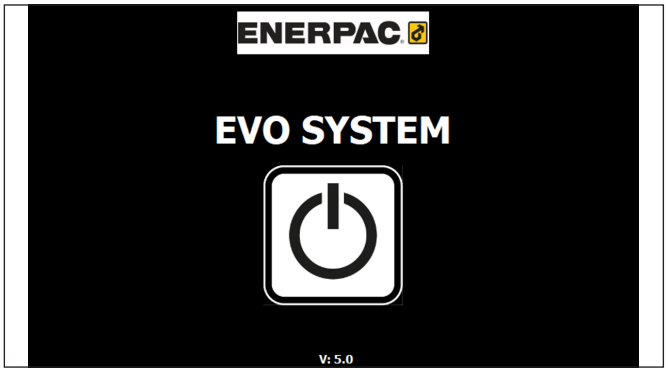

Figure 8: Initial screen

This is the first screen shown by the system. From this screen the operator can access to all the screens of the system and set the movement values.

When the start button is pushed, the system will inquire the ID and Password to log into the user profile.

NOTICE

The system is submitted with the standard user profile which is recorded with the ID: enerpac and password: 100.

6.2 Main Screen

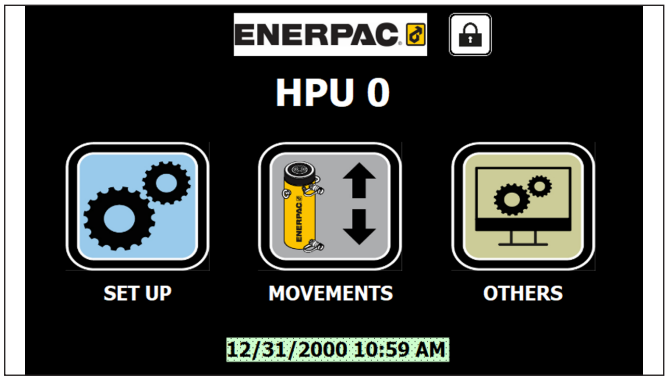

Figure 9: Main screen

This is the general screen of the software. From this screen the user can access to the Set Up screens in order to configure parameters of the EVO, to the Movements screen to select the type of movements which cylinders will perform and to Others screen where the operator can adjust other features of the software not related with the movements.

The screen shows 3 buttons, Set Up button, Movements button and Others button.

When the user taps on each button a pop up come up with shortcuts to the screens belonging to each section. Refer to Figure 10.

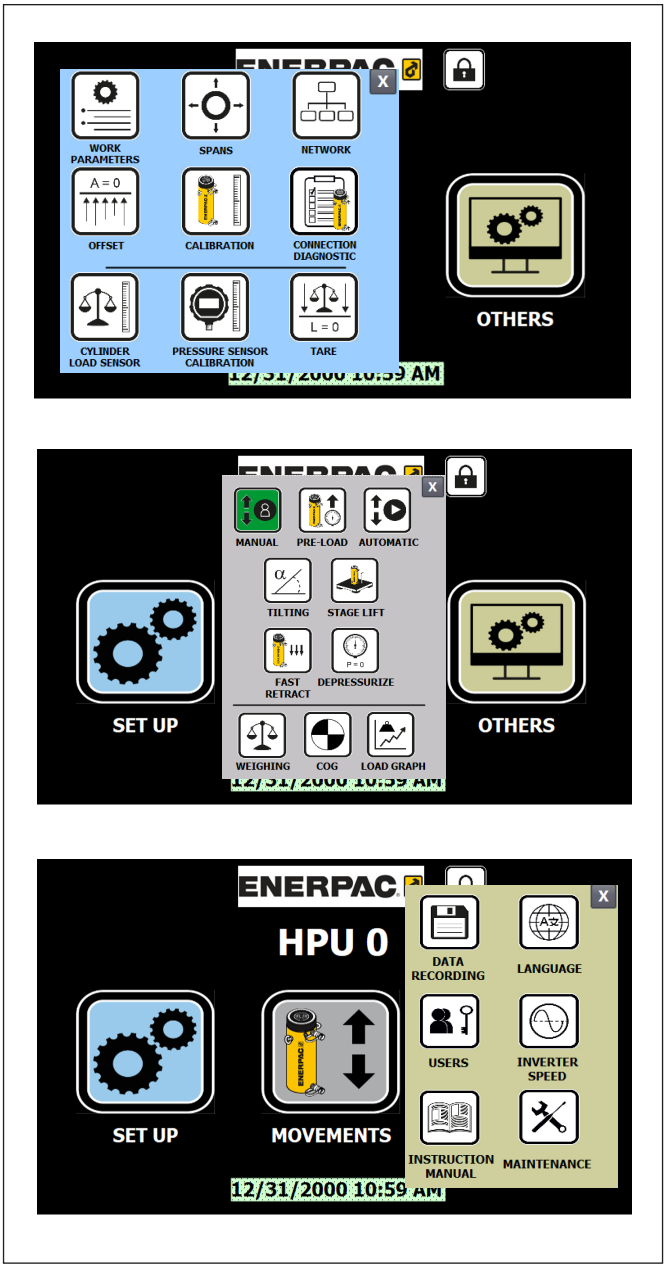

Figure 10: Pop Up Screens

Movements pop up

In Movements pop up, the user can access to Manual, Preload, Automatic, Tilting, Stage Lift, Fast Retract, Depressurize, Weighing, COG and Load Graph screens. Tapping on each button the user can access to all screens of Movements section. The background colour of this section and screens is gray.

Set Up pop up

In Set Up pop up the user can access to Work Parameters, Spans, Network, Offset, Cylinder Calibration, Connection Diagnostic, Cylinder Load Sensor, Pressure Sensor Calibration and Tare screens. Tapping on each button the user can access to all screens of Set Up section. The background colour of this section and screens is blue.

Others pop up

In Others pop up the user can access to Data Recording, Language, Users, Inverter Speed, Instruction Manual and Maintenance screens. If Maintenance is tapped,

another pop-up will appear with Diagnostic, Hour Counter, Pressure Diagnostic and Control Panel options. Tapping in each button the user can access to all screens of Others section. The background colour of this section and screens is yellow.

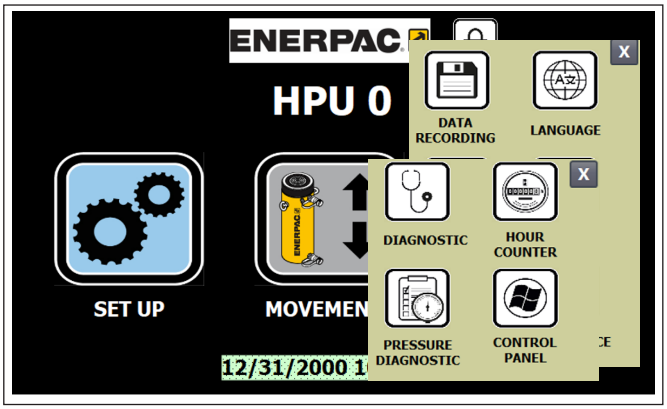

Figure 11: Maintenance Pop Up

In each section screens there is an arrow which allows to merge a slide with the shortcuts to the screens of the selected section. Through these slides, the user can easily navigate between screens.

In order to see the section slides, the user must tap an arrow placed in the screen. In Set Up section the arrow is placed on the left of the screen, for the Movements section the arrow is placed on the lower right corner of the screen and for the Others section the arrow is on the right of the screen. Refer to Figure 12 to see the slides of every section.

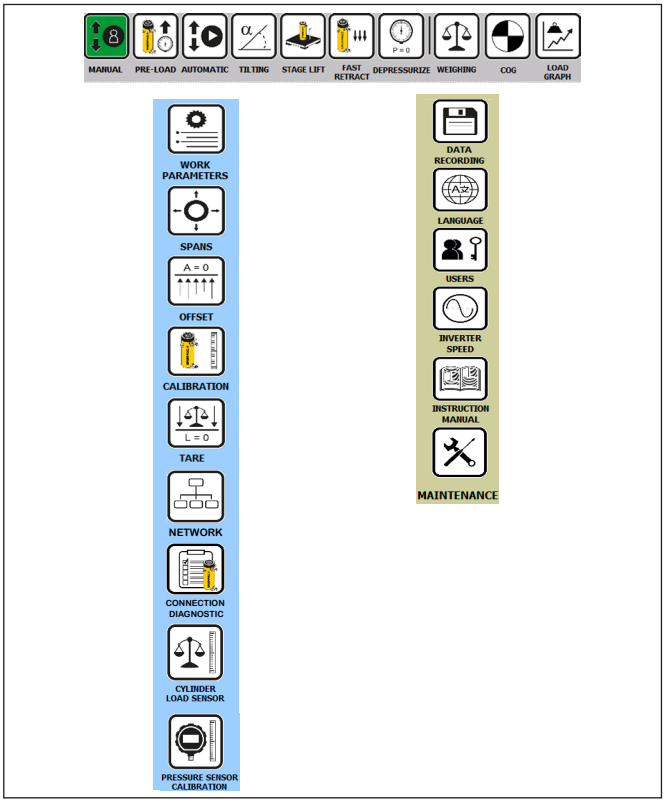

Figure 12: Section slides

The software has a common header for all screens, refer to Figure 13. This header shows the following information:

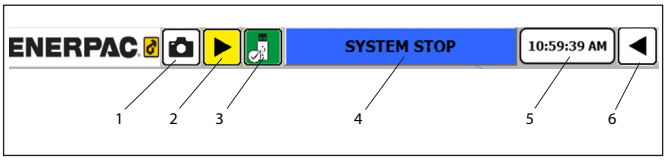

Figure 13: Details of the screens common header

1. Snapshot: This button makes a snapshot of the current screen and save it in USB memory.
2. Recording buttons: Pushing this button, the user can start, pause, and stop the data recording of the current movement. This values will be saved in the USB memory.
3. USB Connection status: This section will remain white while there is no USB connected to the port, turning green when there is successful connection to a USB memory.
4. System status indicator: In this section the software displays the status of the system.
5. Time section: This section shows the current time. The local time can be adjusted in the control panel screen. Refer to paragraph 6.31 for detailed information.
6. Back button: The user can go back to the previous screen pushing this button.

6.3 Work Parameters Screen

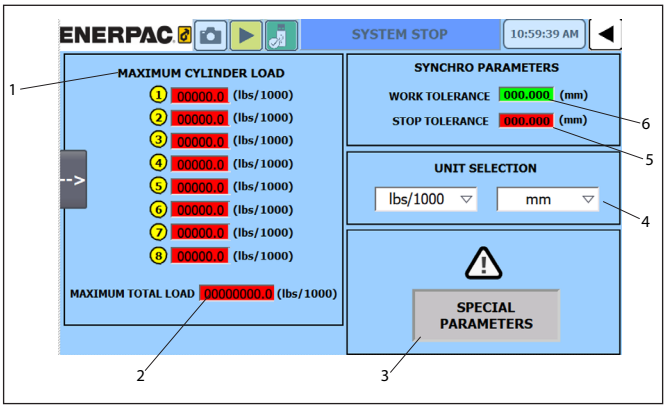

Figure 14: Work Parameters screen details

In this screen the user must define some movements and security values of the system. In this screen, the following elements are found:

1. Maximum Cylinder Load: The user must type the maximum load expected of each cylinder. When this value is exceeded a warning alarm will be shown by the system.
2. Maximum Total Load: The user must type the maximum load expected of the cylinders involved in the current application. When this value is exceeded the movement will be stopped by the system.

⚠ WARNING

The maximum load expected of each cylinder must be always lower than the cylinders capacity. Refer to the cylinders features to know the maximum capacity of each cylinder.

3. Special Parameters button: Pushing this button,

the user can access to the special parameters screen. The system will require an ID (enerpac) and Password (200). Refer to the paragraph 6.3.1 for further details.

4. Units Selection: The user can select the units whereby the system will show the values. This values can be:

- Load units: lbs/1000, Ton (1000 kg), s Ton (907,18 kg) and kN.
- Dimensional units: mm or inches.

5. Stop Tolerance: When multiple cylinders are being used in synchronized application, there is a range of desynchronization between the most extended and the most retracted cylinder. The user must type in this box which is the maximum admissible value between the most extended and the most retracted cylinder. If this value is exceed the system will stop the movement through a stop alarm.
6. Work Tolerance: The user must type in this box which is the synchronization value between the most extended and the most retracted cylinder. If this value is exceed the system will stop the most extended cylinder until the most retracted cylinder reaches into the typed range.

6.3.1 Special Parameters Screen

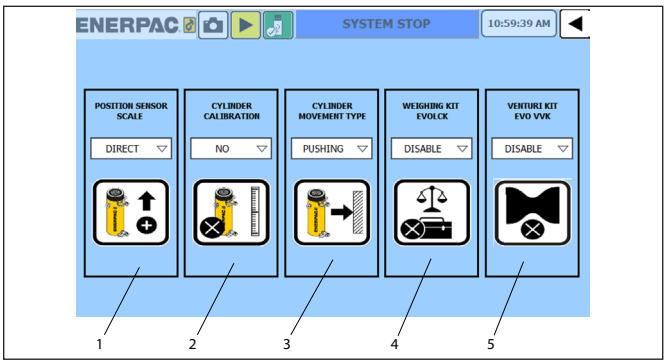

Figure 15: Special parameters screen detail

The access to this screen is locked by an ID (parameters) and password (200). The user can access to this screen from the Parameters screen (Refer to paragraph 6.3).

In this screen, the following elements are found:

1. Direct / Indirect layout: Depending on where the stroke sensor is placed, the user must select one of these two options. When the cylinder plunger and the stroke sensor are extending at the same time, (positive movement) the movement is called Direct. When the cylinder is extending but the stroke sensor wire is retracting (negative movement) the movement is called Indirect.

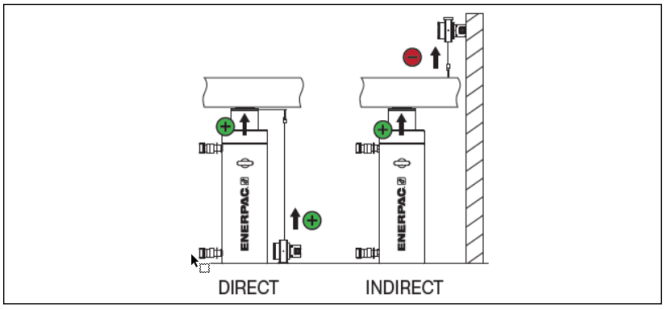

Figure 16: Direct and indirect layout

2. Cylinder Calibration Selection: The user must set if the calibration is going to be carried out or not, depending on how the stroke sensor is placed. Refer to Figure 17 for further detail.

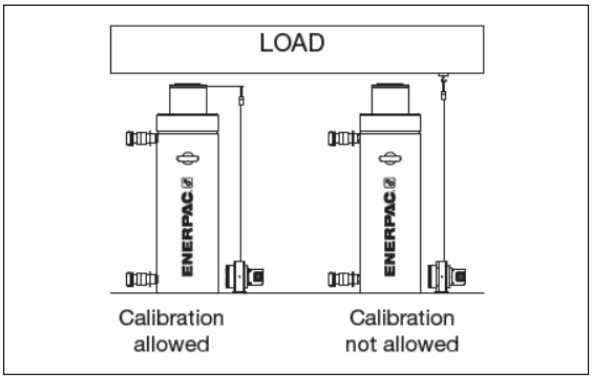

Figure 17: Calibration conditions

NOTICE

Calibration operation must be carried out depending on how the hook of the stroke sensor is attached. If the hook is attached to the cylinder's rod, or if an internal stroke sensor is used, calibration must be done. If the hook is attached directly to the load to be moved, then calibration is not allowed.

3. Cylinder Movement type: Depending on the cylinder movement, the user must select pushing or pulling.
4. Weighing Kit EVOLCK: This option must be enabled if a Weighing Kit is being used.
5. Venturi Kit EVO VVK: This option must be enabled if a Venturi Kit is being used.

6.4 Spans Screen

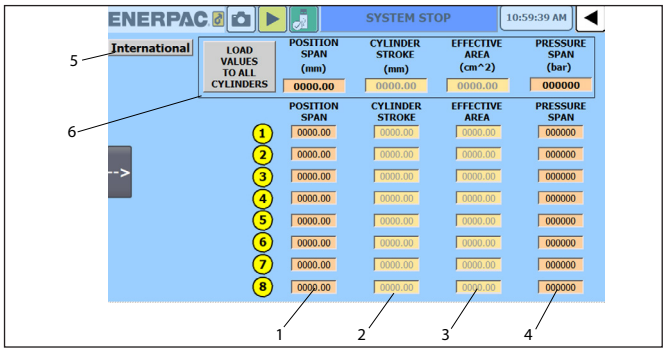

Figure 18: Spans screen detail

In this screen the user can enter the parameters of the elements used with the EVO system in the movements, such as the cylinders installed in the application, to set the calculations of the movement.

There is a row of parameters to configure per cylinder available to install. The N°. of cylinders that can be installed depends on the EVO model (4 points, 8 points and 12 points).

Row 1 will belongs to the parameters of the elements which monitor cylinder 1, row 2 to cylinder 2, etc... In the boxes the user can type the following data (Refer to Figure 18):

1. Position span: The user must type the maximum length of the stroke sensor installed on each cylinder.

2. Cylinder stroke: The user must enter the maximum stroke of the cylinder.

NOTICE

The standard stroke sensors position spans are 100, 125, 375, 500 ,750, 1000, 1250 and 2000 mm.

3. Effective area: The user must type the cylinder surface area.
4. Pressure span: The user must type the pressure transducer's maximum range.

NOTICE

Standard pressure transducers have a maximum reading of 11,600 psi (800 bar).

5. Units button: The user can switch a different unit system pushing this button. The unit systems can be International System of Units, or Imperial System of Units.
6. Load values button: With this button the user can copy identical spans values to all cylinders working in the synchronization.

NOTICE

The user can find the values of the previous parameters in the label or features description of each element.

6.5 Offset Screen

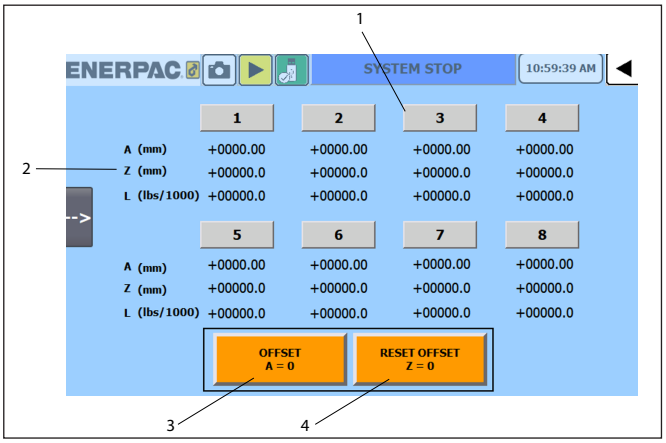

Figure 19: Offset screen detail

Offset is generally used to have a dimensional reference when a load is lifted to an unknown position and it is subsequently lowered at the initial position.

Since the wire of the stroke sensor will normally need to be extended a short distance to reach the load, the offset screen can save that value so the user can reference that starting point after the lift is completed. By assigning an offset value prior to start lifting the load, the user will have a reference point of the initial position.

The offset variable (Z) is used as a memory variable. When Offset is done, the value that currently has the variable A (absolute position) is stored in Z.

"A" value represents the absolute extension of the stroke sensor between 0 and full extension. When the user presses and holds the Offset button (A=0), the current "A" value is stored in the memory as "Z", and "A" is reset to zero. "A" now becomes the reference value for the starting point of the lift. When the lift is complete, the user can press Reset button (Z=0) to reset "A" back to normal value.

In this screen the following elements are found:

1. Cylinder selection buttons: The user can select the cylinders which will be involved in the movement or operation.
2. Movement values: There are some values that the system shows during the movement. These are:

- A (Absolute position): The absolute position is the position of the cylinder´s stroke sensor taken from the initial zero. This initial zero is set in the calibration screen if applied (Refer to paragraph 6.7 for further details).
- Z (Offset variable): Memory variable for a movement reference.
- L (Load withstood by cylinder): This value shows the load being withstood by the cylinder.

3. Offset button: Push and hold this button during 3 seconds to turn A value into 0 and Z will keep the current value of A.

NOTICE

The offset value does not disappear when the equipment is turned off or there is a power failure. This value is maintained until the operator performs a reset of the Offset value.

4. Reset Offset button: Push and hold this button for 3 seconds to convert value Z into 0 and A will take the current value of Z and will add it to the current value.

$$A_f = A_i + Z$$

6.6 Network Screen

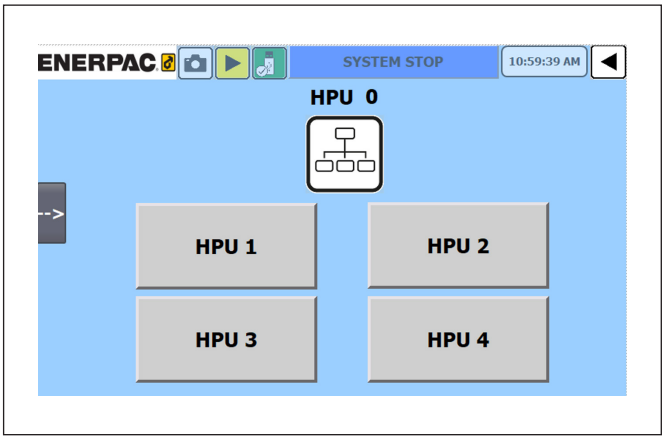

Figure 20: Network screen

This screen is used when there are two or more EVO system working simultaneously.

Through this screen the user must set in the CNLC12 controller the current number assigned to each powerpack (HPU). The system can work in line with up to 4 powerpacks.

NOTICE

Please, refer to L4476 for further information of the EVO controller CLNC12.

6.7 Calibration Screen

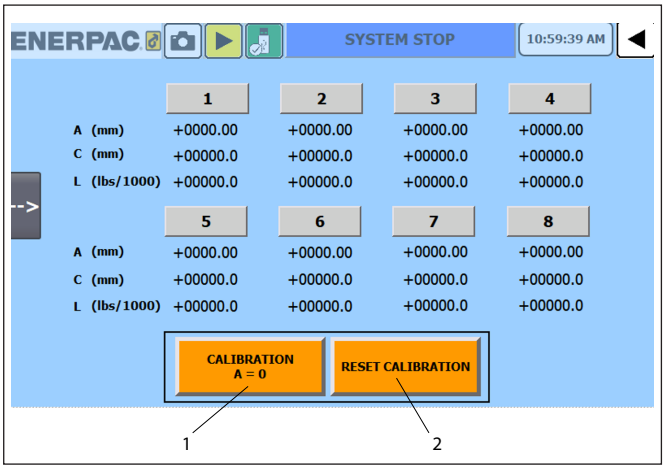

Figure 21: Calibration screen detail

When the stroke sensor wire is connected to the cylinder‘s rod, or if an internal stroke sensor is used, the system reads the extended length of the sensor (A value). In that moment, A has a real reading of the sensor. Refer to Figure 21 for details.

To equal the stroke sensor position with the rod position, the user must perform the calibration of the cylinder. When the calibration work is done, the cylinder will have value A = 0 when retracted.

This screen has similar elements as the Offset screen. Two buttons are different:

1. Calibration: If calibration is allowed, based on the location of the stroke sensor (refer to paragraph 6.3.1 for further details), this button do the calibration (equals the cylinder stroke value and the stroke sensor value) and will set the Absolute position of the cylinder (A = 0).

⚠ CAUTION

This step should only be performed with the sensor connected to the cylinder’s rod fully retracted to ensure the sensor will be properly calibrated.

2. Reset Calibration button: If during the calibration process something goes wrong, this button reset the calibration process.

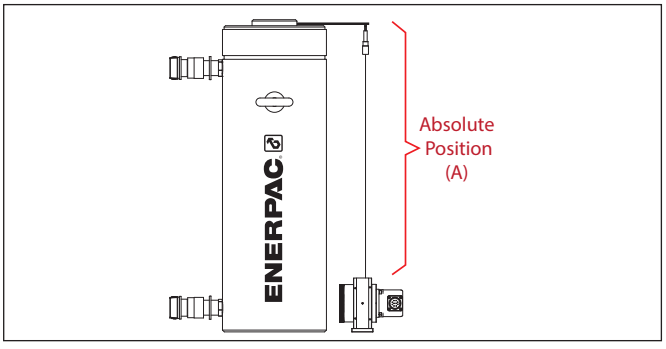

Figure 22: Detail of A value

6.8 Connection Diagnostic Screen

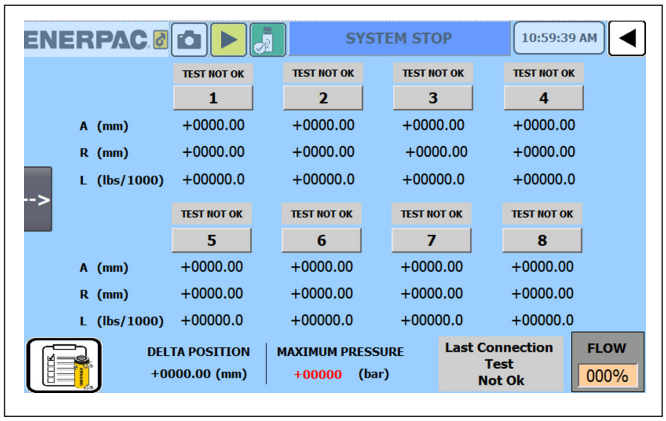

Figure 23: Connection diagnostic screen detail

This screen is used to assure hoses and stroke sensors are correctly connected to every cylinder.

Pressing the diagnostic button, the system will test the connections of all cylinders one by one. If the test is successful, the square above every cylinder selection button will turn green.

6.9 Cylinder Load Sensor Screen

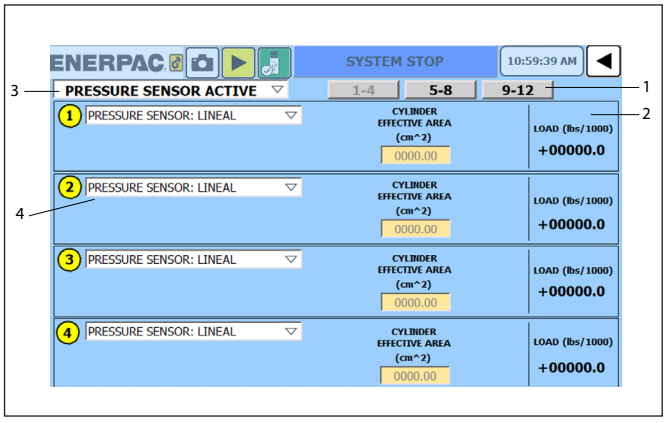

Figure 24: Cylinder load sensor screen detail

In Cylinder Load Sensor screen the operator can select the needed load device type to be used and set it´s parameters. The system is able to work with 4 different modes of load devices.

In this screen the following elements are found:

1. Cylinder Selection Button: With this button the operator can move between the screens of the cylinders groups. These groups consist of 4 cylinders each.
2. Load Value: This section shows the load value read by the device.
3. Load Device Selector: The user can select the type of device to read the load weight. These can be pressure sensors or load cells. The second option only will be available if a weighing kit EVOLCK is installed on the EVO unit.
4. Load Device Mode Selector: The user can select the mode in which the load device is going to work. These different modes are:

- Load Cell Lineal: The user can type the load cell

span (maximum reading capacity) of it´s lowest and the highest output value given in mv/V. Enerpac strongly recommends to type the load cell serial number to identify it correctly.

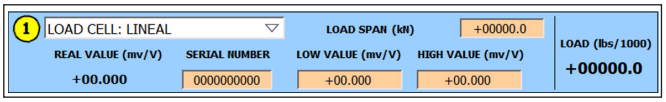

Figure 25: Load cell lineal mode

- Load Cell Polynomial: These load cells calculates the weight using a mathematical polynomial in which parameters must be typed by the operator. These parameters are given by the load cell manufacturer or by the calibration certificate.

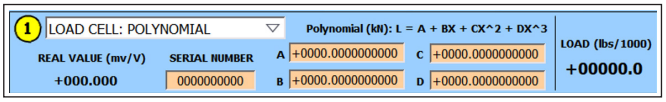

Figure 26: Load cell polynomial mode detail

- Pressure Sensor Lineal: Other way to measure load weight is through pressure sensors. To make the calculation, the cylinder effective area is required. Refer to Figure 24 for detailed view of this mode.
- Pressure Sensor Cylinder Calibration: This mode is more accurate than the previous one but however it takes more time to set up. The operator must calibrate the pressure sensor with a calibrated cylinder. The machine has up to 12 reading possibilities (one per cylinder). They are called calibration tables. The operator can type in the name box the table (cylinder) name. If the table button is pushed, the user will access to the calibration tables screen.

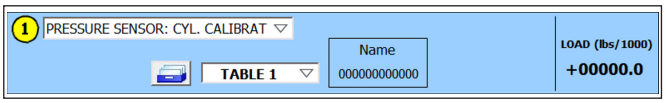

Figure 27: Pressure Sensor: Cyl Calibrate. mode detail

6.9.1 Calibration Tables Screen

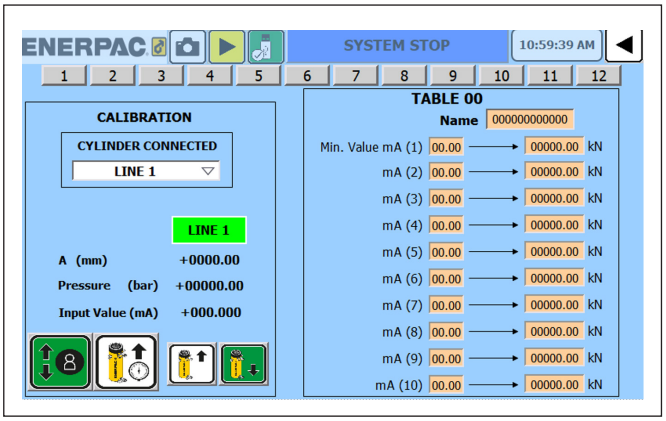

Figure 28: Calibration tables screen detail

In this screen the operator can select the different calibration tables in the top row. Pushing in each number, the corresponding table will show up (one per cylinder).

6.10 Pressure Sensor Calibration Screen

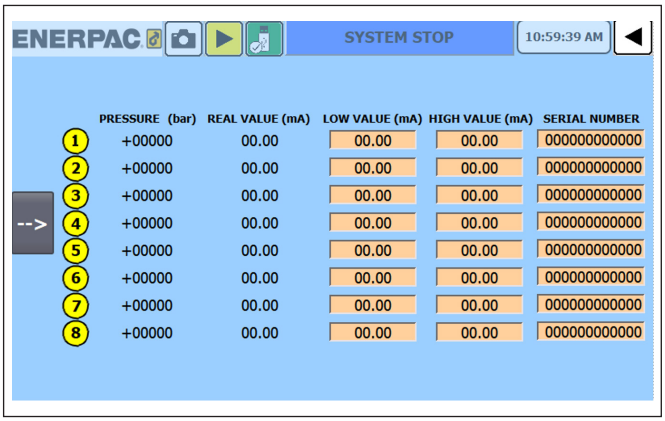

Figure 29: Pressure sensor calibration screen

This screen is used when the operator needs more accuracy when reading the load. Therefore the minimum and maximum analogical values given by the calibration certifies of pressure transducers can be typed manually.

The screen shows the machine pressure in each point and the real value of analogical signal. The parameters that can be typed are Low Value and High Value. These values must be given by the manufacturer. Furthermore the operator can type the serial number of the transducer in order to have a reference trace.

By default all values are in 4.00 mA (as the minimum value), and 20.00 mA (as the maximum value). It is hardly recommended do not change these values if it is not clear which are the calibration values.

6.11 Tare Screen

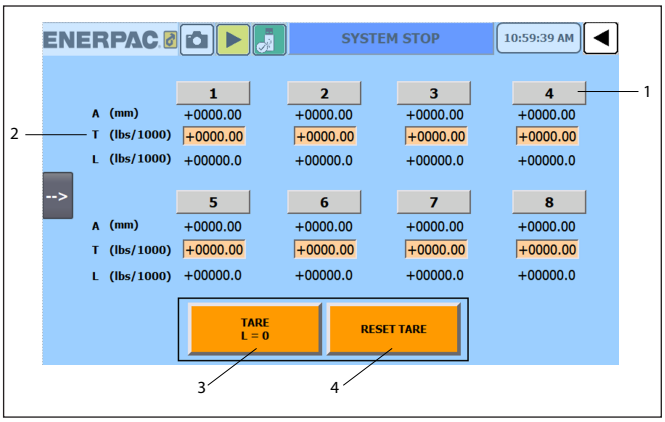

Figure 30: Tare screen detail

Through tare screen, the system can make a “reset” in the load value when any structure (with a considerable weight) is placed between the cylinder and the load. With the tare button the system takes the zero value with the added structure weight.

In this screen the following elements are found (Refer to Figure 30):

1. Cylinder Selection Button: Select this button to select the cylinder(s) to be tared.
2. Movement values: There are some values that the system shows during the process:

- A (Absolute position): The absolute position is the position of the cylinder rod taken from the initial zero. This initial zero is set in the calibration screen if applied (Refer to paragraph 6.7 for further details).
- T (Tare Value): This value indicates the load value of the structure between load and cylinders.
- L (Load Value): This box shows the load withstood by the cylinder in that moment.

3. Tare Button: This button set all cylinders weight to zero. Hold pressed 3 seconds to make the change effective.
4. Reset Tare Button: This button reset the weight of each cylinder to its own real reading.

6.12 Manual Screen

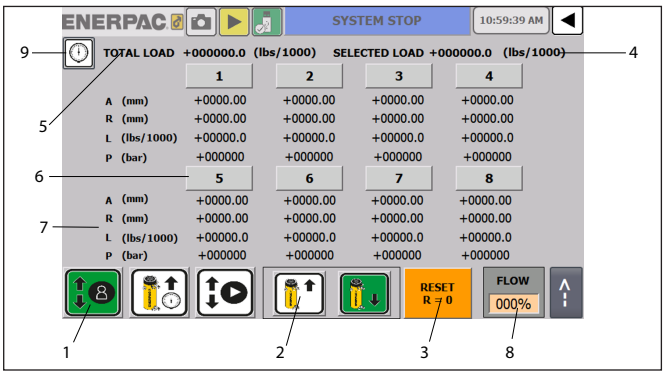

Figure 31: Manual Screen detail

This screen belongs to the Movements section. In this section the user must select the type of movements being executed.

In the case of the manual movements, the user can move the cylinders of the EVO having a total control of the movement. The user can extend or retract the cylinders by pushing and holding the start cycle button and stop the movement just releasing the button. This work mode is used to make small positioning movements in the application.

The user can see the following elements in this screen (Refer to Figure 31):

1. Manual button: Select this button to activate the manual mode in the movement. When this button is selected, the background colour of the button will become green.
2. Upward / Downward buttons: When the manual button is selected, these buttons become visible. The user can push Upward button to retract the plunger inside the cylinder base, and Downward button to extend the plunger out of the cylinder.
3. Reset Relative position button: This button sets to zero the relative position value of the movement. Push this button to reset this value.
4. Selected Load value: This value shows the load being withstood by all selected cylinders.
5. Total Load value: This value shows the load being withstood by all installed cylinders. This value results from the sum of all system loads.
6. Cylinders selection buttons: The user must select the cylinders which will be involved in the movement.
7. Movement values: There are some values that the system shows during the movement. These are:

- A (Absolute position): The absolute position is the position of the cylinder plunger taken from the initial zero. This initial zero set in the calibration screen if applied (Refer to paragraph 6.7 for further details).
- R (Relative position): The relative position is the position of the cylinder rod taken from the last zero set point. This is the reference value that the system uses to maintain synchronization between lifting points. (to reset position refer to the point 3 of this section).
- L (Load withstood by cylinder): This value shows the load being withstood by each cylinder in the current moment.

NOTICE

Load values are obtained through the calculation of the cylinder line pressure, and the effective area of each cylinder typed in the spans screen. These values therefore will be approximated with some error margin.

8. Flow: The user can type the flow of the HPU and control the speed of the movement. This value is a percentage and can be typed between 30 and 100% of the total flow. It corresponds to the speed of the motor.
9. Pressure Data Button: Shows the pressure of all system cylinders. It is shown in the screen as P.

Some points are common elements in the movements screens. These elements will not be explained again in the following paragraphs.

6.13 Preload Screen

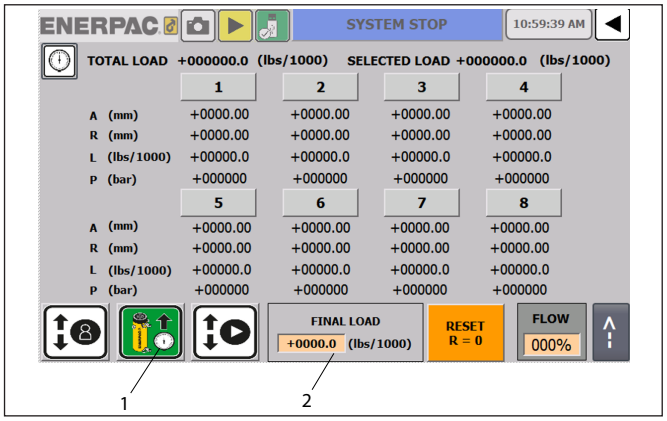

Figure 32: Preload Screen Details

The Preload screen contains the same elements as the manual screen (Figure 31). Only the elements pointed in Figure 32 are changing.

In this work mode, the operator has to define a target load that each cylinder must get. Cylinder rod will automatically move until each cylinder reaches the specified load.

NOTICE

Enerpac recommends carrying out this step prior to lifting a structure in Automatic mode because in this way the user ensures all cylinders are in full contact with

the structure. The operator should enter a small load value to ensure that all cylinders support that value.

In this screen there are two important elements:

1. Preload button: Select this button to set the preload movement in the system. When this button is selected, the background colour of the button will become green.
2. Final Load parameter: The user must type the final load that the cylinder must reach to finish the cycle.

NOTICE

Enerpac recommends setting the final load value to less than 10% of the expected load.

6.14 Automatic Mode Screen

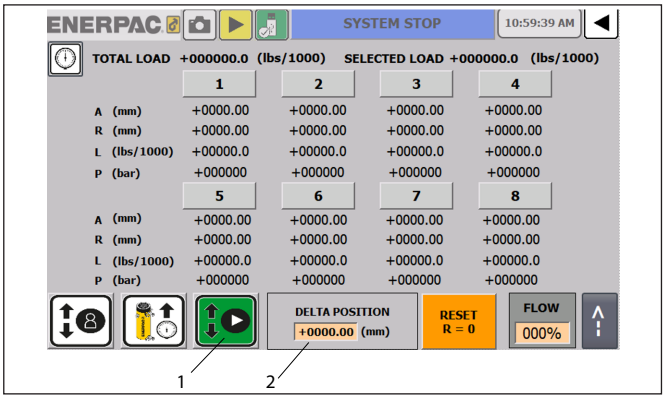

Figure 33: Automatic Screen Details

The Automatic mode screen contains the same elements as the manual screen (Figure 31). Only the elements shown in Figure 33 change.

This work mode is used to perform synchronous movements. The user must type a distance increment value (Delta) and cylinders will move synchronously that distance.

In this screen the following elements are found:

1. Automatic button: Select this button to activate the automatic mode in the movement. When this button is selected, the background colour of the button will become green.
2. Delta Position value: The user must type in this box the increment of the current position which the cylinder must reach in the next cycle. This increment can be positive (if extending cylinders) or negative (if retracting cylinders).

NOTICE

When the cylinder calibration has been performed, the system will not let the user type a higher value than the stroke capacity of the cylinders. It is important the parameter of the cylinder stroke is correctly entered into the Span screen (paragraph 6.4) to avoid cylinder damage.

If cylinder calibration was not performed, the system will recognize the stroke sensor maximum range as the limiting value up to which cylinders can extend.

6.15 Tilting Screen

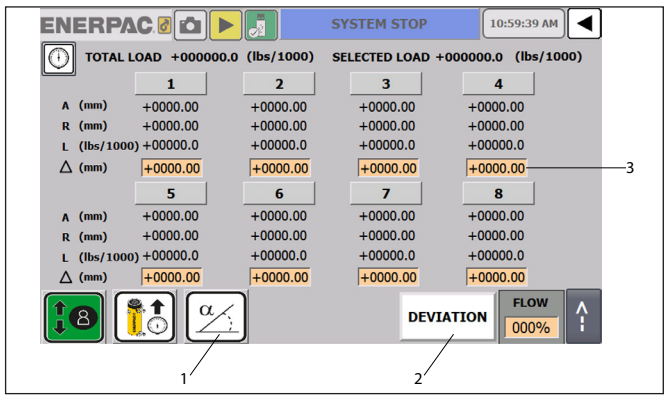

Figure 34: Tilting Screen Details

This movement allows making movements with load inclination purposes. This work mode allows setting a different Delta value for each cylinder and make synchronous movements of every cylinder in such a way that all cylinders finish at the same time.

The Tilting screen contains the same elements as the Manual screen (Figure 31). Only the elements shown in Figure 34 change.

In this screen the following elements are found:

1. Tilting mode button: Select this button to set the tilting movement in the system. When this button is selected, the background colour of the button will become green.
2. Deviation button: This button shows the Deviation screen. In this screen the user can check the current tilting movement details.
3. Delta Final Position: The user must type in this box the increment of the current position which the cylinders must reach in the next cycle. This target can be positive (if extending cylinders) or negative (if retracting cylinders). This value can be set individually for each cylinder.

CAUTION

At the end of each cycle, all the cylinders will finish at the same time. The cylinders with bigger delta will have more stops and waiting time than those with less delta. Consider this features to avoid uncontrolled movements.

6.16 Deviation Screen

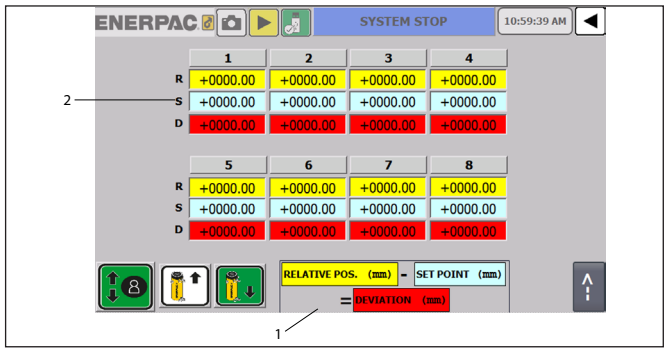

Figure 35: Deviation Screen Details

In this screen the user can check the current tilting movement details.

In this screen the following elements are shown:

1. Key formula: This area shows the formula used to make tilting movement calculations.
   - Relative Position — Set Point = Deviation
2. Tilting movement values of each cylinder:
   - R (Relative Position): This value shows the current position of the cylinder plunger.
   - S (Set Point): This value is the theoretical position which should have the plunger in the current moment, according to the internal calculations done by the system in order to all cylinders reach the final delta target at the same time.
   - D (Deviation): This value is the difference between the plunger theoretical position, according to the internal calculations of the software (Set Point), and the plunger real position in the current movement (Relative Position).

This screen is only for information proposal. The user cannot type or select any value.

6.17 Stage Lift Screen

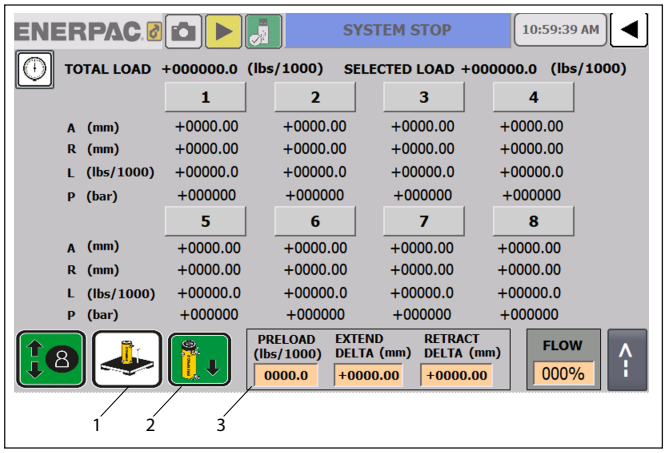

Figure 36: Stage Lift Screen Details

The Stage Lift screen is a solution for incrementally lift or lower a load. In combination with cribbing blocks, climbing jacks are able to overcome lift height limitations of a cylinder plunger stroke.

This movement is based on an automatic movement cycle in which the parameters must be typed in this screen.

The Stage Lift screen contains the same elements as the Manual screen (Figure 31). Only the elements shown in the Figure 36 change.

1. Stage Lift button: Select this button when climbing jacks are used in the system.
2. Lifting/Lowering button: Select the required movement of the system. The arrow shown in the screen will be the sense of the movement followed by cylinders.
3. Stage Lift parameters:
   - Preload: The user must type the load which all cylinders must reach before starting a new cycle.
   - Extend Delta: The user must type the distance which cylinders extend to create a space where operators can insert two outer blocks under the spreading plate. These outer blocks will support the load for the next extension.
   - Retract Delta: The user must type the distance cylinders should retract to create a space where operators could insert a central block. This central block will support the load for the next movement.

6.18 Fast Retract

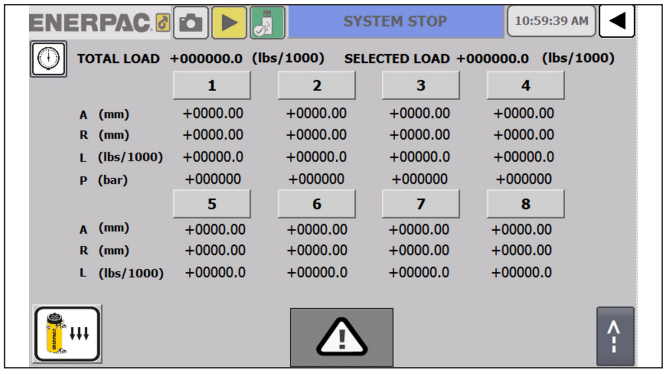

Figure 37: Fast Retract Screen

The Fast Retract screen contains the same elements as the Manual screen (Figure 31). The only difference is the Fast Retract button.

Through this button the operator can lower the selected cylinders without holding the button. Tapping the button and pushing Start Cycle button on the control panel, the oil will be redirected to the tank through the shorter and faster way in order to reduce time for retracting the plungers of the selected cylinders.

In order to retract single-acting cylinders in a faster way, EVO VVK Venturi Kit can be installed. It must be enabled in the Special Parameters Screen. Refer to paragraph 6.3.1 for detailed information.

⚠ WARNING

When this option is being used, cylinders must not have any load on top. The retraction with this method can cause uncontrolled lowering and uneven retracting will result.

6.19 Depressurize Screen

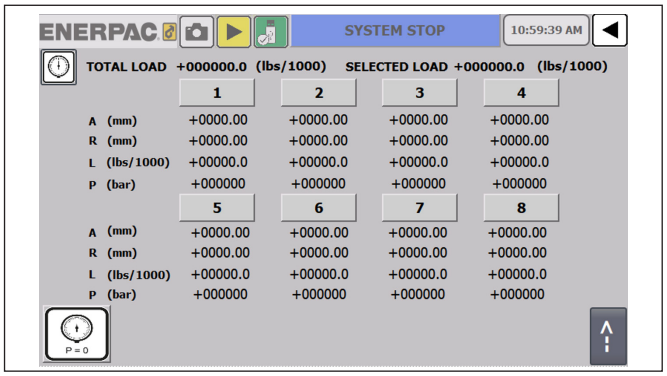

Figure 38: Depressurize Screen Details

Depressurize screen contains the same elements as the Manual screen (Figure 31). The only difference is the Depressurize Button P=0.

After working with the system, the equipment can keep residual pressure. Using this work mode, the system will release the total pressure of pumps, pipes, hoses and cylinders.

Select this button to activate the Depressurize mode. When this button is selected, the background colour of the button will become green.

When this working mode is used, a warning screen will remind the risk taken using this mode with cylinders withstanding a load. Refer to paragraph 7.9, Figure 57 for further information.

⚠ WARNING

It is totally forbidden to depressurize the system while cylinders are holding load. If the system is pressure released while cylinders are loaded could result in death or serious personal injury and property damage.

6.20 Weighing Screen

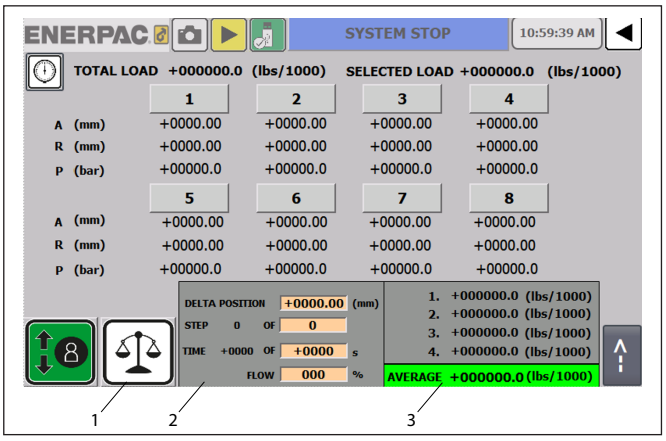

Figure 39: Weighing screen details

The system has been designed with the capability of weighing the load. This measuring is done automatically.

In this screen the following elements are found (Refer to Figure 39):

1. Weighing Button: Press this button to select the Weighing work mode.
2. Weighing Values: The operator has to introduce several values to proceed with the weighing process. This values are:

- Delta position: This is the increment position value up to which cylinders must reach to make the weighing. This position must be always positive as the load needs to be lifted to make a weighinig.
- Number of Steps: The weighing operation can be done in up to 4 steps. This parameter is set to find the maximum accuracy in the load weighing. On the right table the system shows the results of every weight taken.
- Time: In order to have the maximum stability of the load, the system takes the typed seconds to take the weight. When the cylinders reach the delta position typed the system will wait the introduced seconds to read the load.
- Flow: The system can move slower than the normal speed to reach delta position. If the system goes slower the load will keep more stable. Therefore the operator can type the percentage of oil flow influencing in cylinders movement.

3. Average: The system will show the average of those 4 readings taken in each step.

6.21 COG Screen

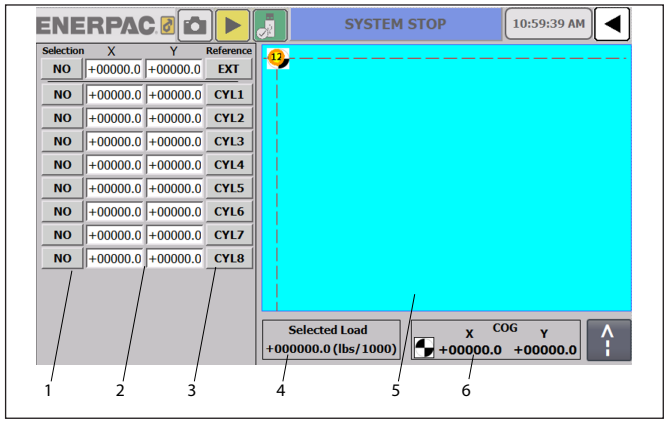

Figure 40: COG screen detail

In this screen the operator can type every value concerning the center of gravity.

Through the selection button the operator can decide what cylinders are included in the center of gravity calculation.

When the cylinders have been selected, the operator must choose which one is going to be the main cylinder. The origin reference (0,0) will be assigned to this cylinder, which means that other cylinders will take the reference from that point. Cylinders will be showed in the canvas according to the position typed. The center of gravity will be calculated automatically.

In this screen the following elements are found (Refer to Figure 40):

1. Cylinder selection buttons: Select what cylinders are included in the gravity center calculation.
2. Position of X and Y axis: Every cylinder has a real position from the cylinder reference. Type the real distance in the X axis and in the Y axis from the main cylinder.
3. Main Cylinder Button: The user can press one of the reference buttons to select the main cylinder.
4. Load of cylinder: This box shows the load withstood by each cylinder.
5. Canvas for graphic: This area is where the system shows each cylinder position and where the COG is located.
6. Gravity Center coordinates: When all data is typed, the system calculates where the gravity center of the load is placed.

6.22 Load Graph Screen

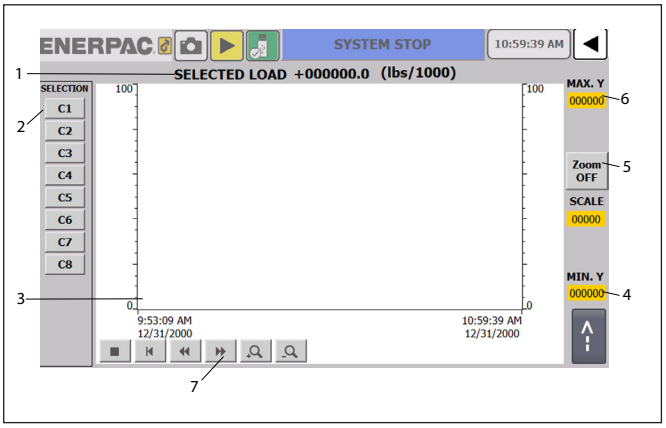

Figure 41: Load graph screen detail

This graph shows the trend of the load withstood by the most loaded and the less loaded cylinder.

Furthermore in this screen, the user can find the following elements (Refer to Figure 41):

1. Selected Load: Total load of selected cylinders.
2. Cylinder selection buttons: Select what cylinders are included in the calculation of the Selected Load.
3. Canvas: It shows a graph with the Selected Load value. This graph is updated every 2 seconds.
4. Min Y Value: Minimum value of Y axis in the graph.
5. Auto Zoom: Activate or deactivate Auto Zoom.
6. Max Y Value: Maximum value of Y axis in the graph.
7. Some buttons to navigate across the graph as stop graph, forward, rewind, zoom in, zoom out...

6.23 Data Recording

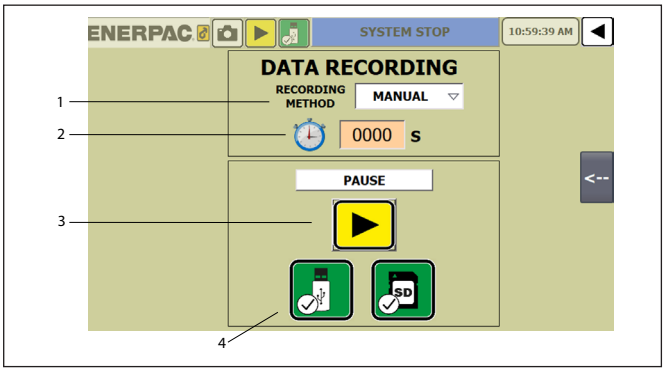

Figure 42: Data Recording Screen Details

Through this screen the operator can record the movement data into an external drive.

In this screen the following elements are found (Refer to Figure 42):

1. Recording mode: Select the recording method (manual or automatic) for recording movement data purpose. When manual option is selected, the system will record only when the user pushes the record button. When automatic mode is selected, the system will automatically record the data when the system is moving.
2. Time period: The user must type the frequency of data recording. The units used are seconds.
3. Start recording button: Push this button to start/pause recording the movements' data in the drive selected. When it is detected that no USB or SD card is connected for recording, the icon will be red.
4. Storage: The storage icons indicates the storage drive in which the recording is saved. These can be USB drive or SD card. When the recording starts, the icon of the storage device in which the data is saved turns green.

6.24 Language Screen

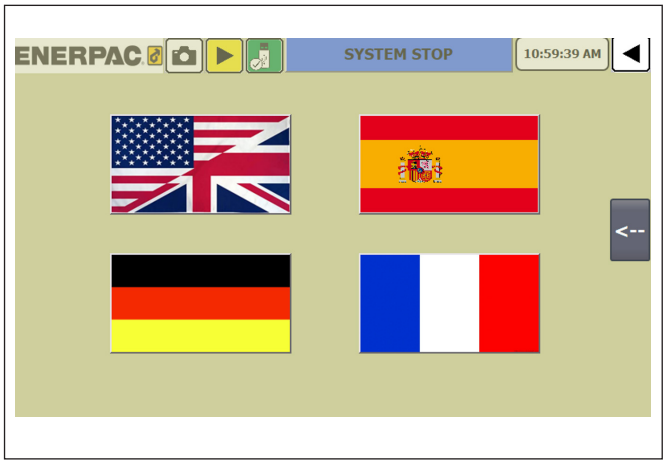

Figure 43: Language Screen

The user can choose the alarms language in this screen. Select the language desired and tap the back button to go to the main screen.

6.25 Users Screen

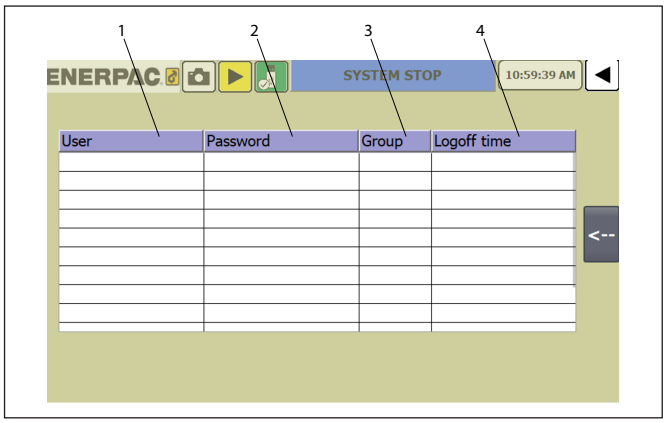

Figure 44: Users Screen Detail

In this screen, the user can create and set several users to manage the system. In this screen the following sections are found (Refer to Figure 44):

1. User: The operator must tap the cell of the table and type a new user. The system will inquire an ID and Password to log into each user profile.

- Operator: This user has general access to operate the system. To access this user, it is required to enter the ID "enerpac" and password "100".
- Expert: The expert has same access rights as the operator but can also access and operate the special parameters within the Work Parameters

screen. This actions require a more advanced user because they are parameters that can completely affect the functionality of the equipment. To access this user, it is required to enter the ID “parameter” and password “200”.

- Administrator: This user is for use by factory authorized technicians only.

2. Password: in the next column, the operator must tap and type the password corresponding to the user.
3. Group: The user has to tap and choose a group name for the typed user.
4. Log off time: The operator must tap and type the number of minutes to log off the system with that user.

NOTICE

To this screen is only reachable by the user logged with Expert profile. Id: parameters, password: 200.

6.26 Inverter Speed Screen

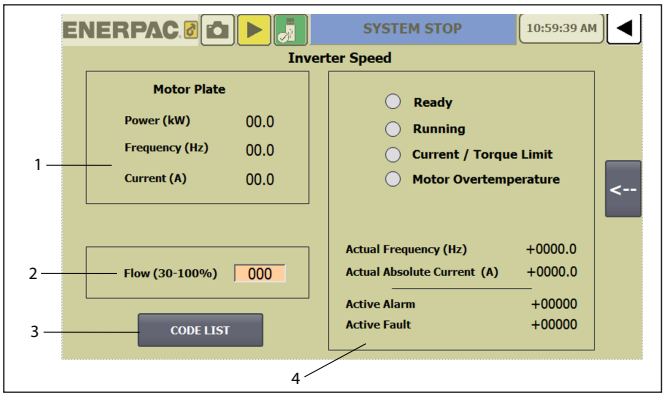

Figure 45: Inverter Speed Screen Detail

This screen shows the frequency inverter status in the current moment. This screen notifies important information for experimented operators. The user must type the oil flow required between 30% and 100%.

In this screen there are the following elements (Refer to Figure 45):

1. Motor features plate: In this square appears the electric motor values.
2. Flow: The system allows selecting the movement speed of the cylinders. This value is a percentage and can be typed between 30 and 100% of the total flow. It correspond to the speed of the motor.
3. Code List: This button gives access to the list of faults and alarms of the system.
4. Status Section: In this section the operator can check the status of the motor. There are the following features:

- Ready: The Inverter speed is already switched on with a good communication with PLC. It is indicated by a green light. When this light is green the motor is ready to be switched on with no fault or alarm in the inverter speed.
- Running: When this light is green indicates that an operation is going on.
- Current / Torque Limit: The light becomes red when the motor has been operating at the torque limit or at the current limit.
- Motor over temperature: The light becomes red when the motor has reached the limit of the working temperature.
- Actual Frequency: This parameter shows the real frequency of the motor.
- Actual Absolute Current: This parameter shows the real current of the motor.

6.27 Instruction Manual Screen

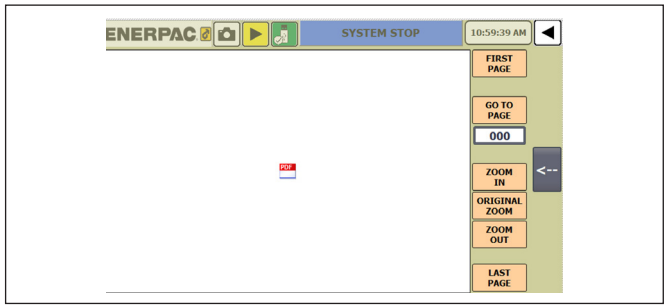

Figure 46: Instruction manual Screen

In this screen, the operator can access to the Instruction Manual of the EVO System.

6.28 Hours Counter Screen

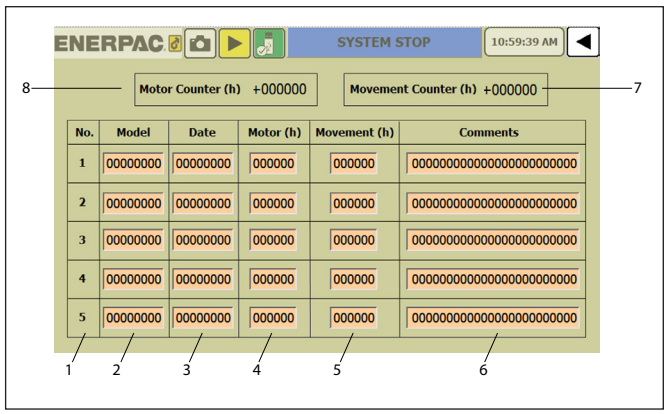

Figure 47: Hours Counter Screen Details

In this screen the user can have a record of the services done to the pump.

In this screen, the following elements are found: (Refer to Figure 47):

1. Row number: The operator can have up to 5 records.
2. Model number: The user can type the model number of the pump.
3. Date: The user can type the date when the service was done.
4. Number of working hours of the motor: The user can type the number of working hours of the motor when the service is done.
5. Number of movement hours: The user can type the number of hours in which movements have been done.
6. Comments column: The user can enter some brief

descriptive comment.

7. Movement counter: This parameter is given to have a reference of how many hours the pump has been working making movements.
8. Motor counter: This parameter is given to have a reference of how many hours the motor has been switched on.

NOTICE

Usually motor counter and movement counter is different, because the pump can be switched on with the motor working but with no movement in the valves or cylinders.

6.29 Control Panel Screen

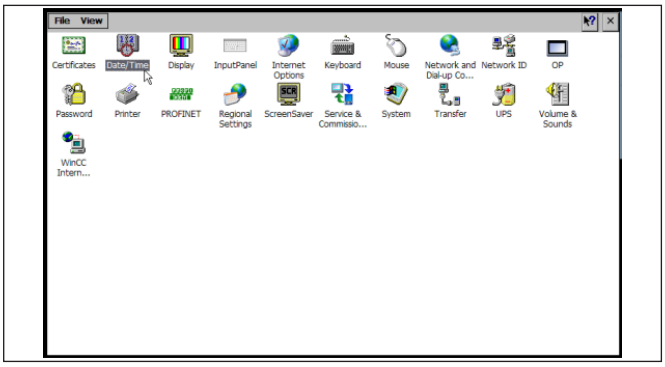

Figure 48: Control Panel Screen

In this screen the user can set date and time of the system. In order to do it, the user must access to the panel control of the system.

⚠ WARNING

In the control panel there are many other icons and options that can be changed. Enerpac dissuades touching other icon except the date and time. Malfunctioning and unset risk exist when other parameters in this screen are changed.

6.30 Pressure Diagnostic Screen

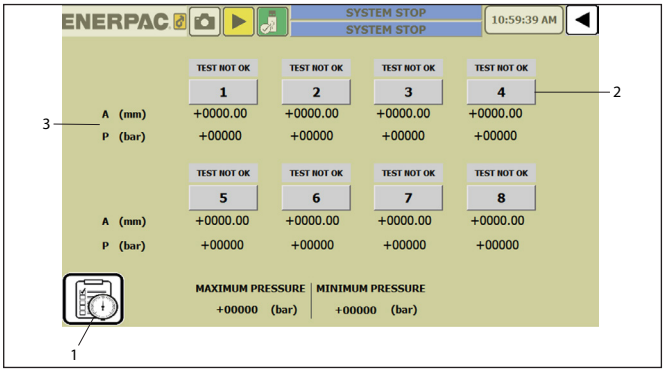

Figure 49: Pressure Diagnostic Screen Details

With this test, the user can check the isolation of the hydraulic system and detect any leakage.

⚠ WARNING

This test must be done without cylinders or hoses connected and with the hinged lids of the frame in the outlets side closed. When the hydraulic connectors are pressurized with no hoses connected, there is a possible risk due to projections.

In this screen the user can find the following parts:

1. Pressure inspection: Pressing this button the system is ready to make the pressure test. Through this mode the system is pressurized firstly in A outlets and secondly in B outlets. If the pressure does not drop in 1 minute, the system will show the advise green and red if the test was not passed.
2. Outlets selection: For the position and flow inspection, the user must select the outlet to be tested.
3. Parameters: The user can check some parameters during the test. These parameters are:

- A: Absolute position of the cylinder during the test.
- P: Pressure build in each line.

7. OPERATION

The orders for the movement must be done by the user through the buttons placed on the control panel. The kind of movement must be set on the touching screen and movements orders with the buttons.

7.1 Switching ON the system.

Do the following steps to switch on the system:

1. Perform a visual check of the hoses and cylinders, assuring these are not bent and installed in the correct position.
2. Check the level of oil. Bear in mind that if cylinders are extended, the reservoir level should be low.
3. Be sure the safety stop button is not activated.
4. Turn ON the main switch in the electric cabinet. Refer to the Figure 50 to see the location of the main switch of the system.
5. Check the power light in the control panel. It must be white.
6. Wait until the control software is loaded and check the operating parameters. Adjust them if needed.
7. Check for alarms in the control. If any alarm has came up, check and solve the root cause and push the reset alarm button in the control.
8. Switch ON the motor in the EVO.

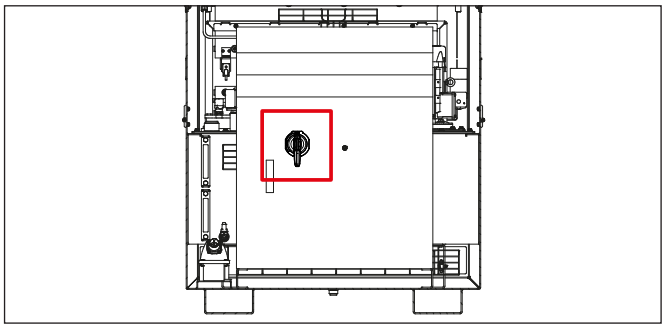

Figure 50: Main switch layout

7.2 Switching OFF the system

Do the following steps to switch off the system:

1. Push the stop cycle button if a movement is being performed.
2. Push the Stop Motor button.
3. Switch off the system from the main switch.

7.3 Cylinder calibration

Calibration operation must be carried out depending on how the hook of the stroke sensor is attached. If the hook is attached to the plunger, the calibration must be done. If the hook is attached directly to the load to be moved, then calibration must be avoided. A cylinder with a internal stroke sensor must be calibrated too. Refer to Figure 17 for details.

⚠ WARNING

Enerpac strongly recommends always to set the layout of the cylinders in such a way that the calibration is allowed. If cylinders are not calibrated or are wrongly calibrated, a malfunctioning or cylinder damage risk exist.

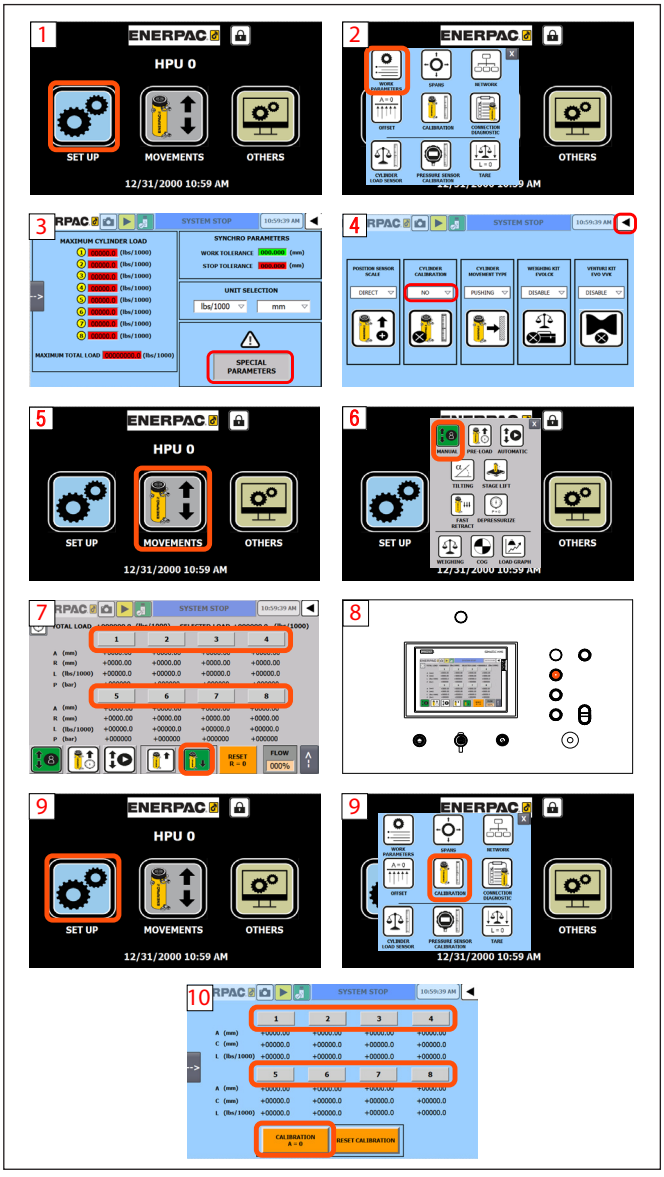

Figure 51: Calibration Procedure

In order to calibrate correctly the cylinder, follow the steps below:

1. Place stroke sensor in a way that calibration can be done. Refer to 6.3.1, Figure 17.
2. Go to Work Parameters, and then tap the Special Parameters button. Enable the calibration capacity. Refer to paragraph 6.3.1, Figure 15.
3. Go to Manual screen. Refer to paragraph 6.7, Figure 21.
4. Select Manual mode.
5. Select Downward button.
6. Select the cylinders to be moved.
7. Switch on the motor.
8. Push and hold Start Cycle button until the cylinders selected are completely retracted.
9. Push and hold the calibration button during 3 seconds. The Absolute position value will become to zero when the calibration has been performed.

NOTICE

Sometimes some error can be committed during the calibration works. Push reset calibration button during 3 seconds and the last configuration will be set. Restart again the previous steps to restart the calibration.

7.4 Manual Mode

Manual mode is used to move cylinders in a free way. This mode is used to check and set the cylinders before a work and also for maintenance purposes. Refer to paragraph 6.12 for detailed information.

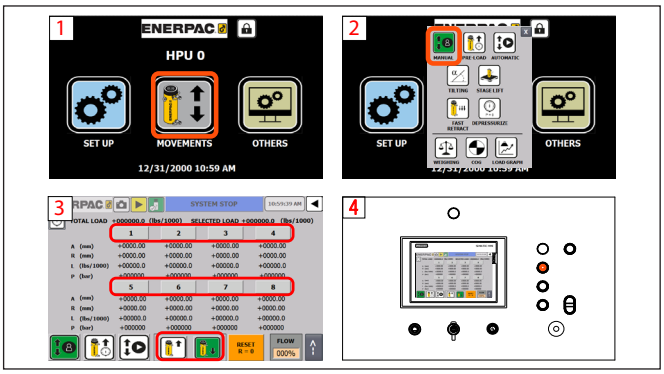

Figure 52: Manual mode procedure

NOTICE

Be informed that with this mode the cylinders does not make synchronized movements between them.

In order to work with this mode, follow the steps below:

1. Ensure that all elements are correctly plugged and does not exist any alarm.
2. Go to Manual screen.
3. Select Manual button.
4. Select the cylinder movement sense, outward or inward. Also the user can set the oil flow of the EVO.
5. Select the cylinders required to be involved in the movement by tapping the Cylinder Selection buttons. When a cylinder is selected, the button background becomes green.

6. Push Start Motor button.
7. Push and hold down the Start cycle button.
8. When cylinder plungers are placed in the desired position, release cycle button and the movement will be stopped.

7.5 Preload Mode

Enerpac recommends carrying out this step prior to lifting a structure in the Automatic mode because in this way the user ensures that all the cylinders are in full contact with the structure. The operator should enter a small load value (5-10% of the total load) to ensure all cylinders withstand that value of the load.

This mode allows to have a real reference of the position of the load, and avoid some cylinders make unladen work. Refer to paragraph 6.13 for detailed information.

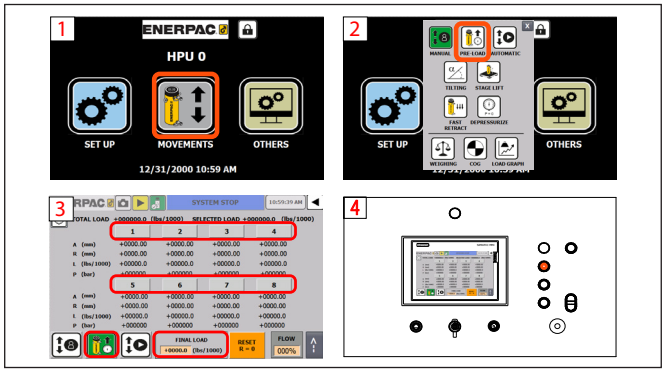

Figure 53: Preload mode procedure

In order to work with this mode, follow the steps below:

1. Ensure that all elements are correctly plugged and does not exist any alarm.
2. Go to Preload screen.
3. Select the direction of the movement which cylinders will follow.
4. Type the final load that cylinders must reach.
5. Select the cylinders which are going to be involved in the movement by tapping the cylinders buttons. When the cylinder is selected, the button background becomes green.
6. Push the start motor button.
7. Press the Start Cycle button in the keypad.
8. When every cylinder reach the final load, the system will stop the cycle.

NOTICE

When this movement is finished the system has a real reference of the load position. When every cylinder are touching the load, the operator must press reset button to have a new zero for the relative position.

Enerpac recommends also making an Offset when the cylinders reached the final load after performing the Preload mode. Using this step the user will have a provisional zero in case of needed.

With this work mode, the cylinders do not make synchronized movements to reach the target.

7.6 Automatic Mode

With this work mode, the user can do synchronized movements of the cylinders into a previously typed position increment. In this work mode the user types a position increment and cylinders move to that position synchronously. Refer to paragraph 6.14 for further information.

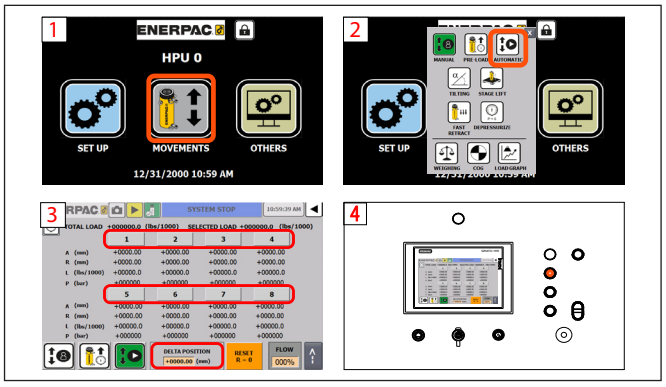

Figure 54: Automatic mode procedure

In order to work with this mode, follow the steps below:

1. Ensure all components are correctly plugged and does not exist any alarm.
2. Go to Automatic screen.
3. Press Automatic mode button.
4. Type Delta Position parameter. Delta Position is the distance that the plunger of the cylinders must reach. This distance can be positive or negative, depending on the movement sense (extending or retracting).

NOTICE

If the cylinders are calibrated, the system will not leave to type a value higher than the stroke capacity of the cylinders. It is important the parameter of the cylinder stroke is correctly entered into the Span screen (Paragraph 6.4, Figure 18) to avoid cylinders damage. If the cylinders are not calibrated, the system will not leave to type a value higher than the stroke sensor length.

5. Select the cylinders required to be involved in the movement by tapping the Cylinder Selection buttons. When the cylinder is selected, the button background becomes green.
6. Push the Start Motor button.
7. Press Start Cycle button.
8. When the cylinders reach Delta Position, the system will stop the movement and will end the work cycle. If a new Delta Position value is introduced or Start Cycle button is pushed, a new work cycle will start.

7.7 Tilting Mode

This movement allows the user to do load inclination movements. This movement allows the user to set different targets for each cylinder and make a synchronous movement in such a way that all cylinders finish at the same time. Refer to paragraph 6.15 for further information.

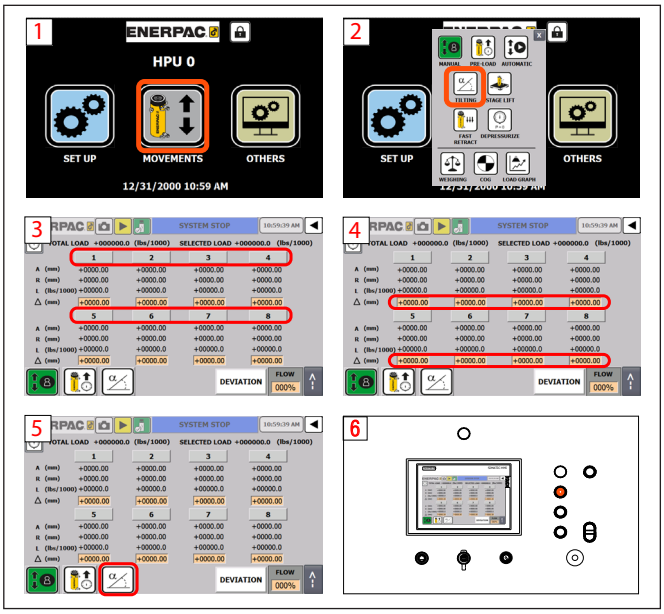

Figure 55: Tilting mode procedure

In order to work with this mode, follow the steps below:

1. Ensure that all elements are correctly plugged and does not exist any alarm.
2. Go to the Tilting screen.
3. Select the cylinders required to be involved in the movement by tapping the cylinder selection buttons. When the cylinder is selected, the button background becomes green.
4. Type Delta Position (the increment of the current position) of every cylinders selected. Delta Position can be negative or positive.
5. Select Tilting button.
6. Push the Start Motor button.
7. Push Start Cycle button.
8. When the cylinders reach Delta Position, the system will stop the movement and will end the work cycle. If a new Delta Position value is introduced or Start Cycle button is pushed, a new work cycle will start.

7.8 Stage Lift Mode

This is an operation mode that gives a solution for incrementally lifting or lowering a load. In combination with cribbing blocks and climbing jacks this mode is able to overcome the lift height limitations of a cylinder's plunger stroke. Refer to the paragraph 6.17 for further information.

There are two kind of procedures, lifting a load and lowering a load:

Lifting a Load

1. Ensure that all elements are correctly plugged and does not exist any alarm
2. In the climbing jacks, stroke sensors make a negative reading when the plunger is going out. Remember that indirect reading must be selected in this case. Refer to the section 6.3.1, Special Parameters screen.
3. Go to Stage Lift screen.
4. Select Stage Lift button.
5. Choose the direction of the movement which climbign jacks will follow. In this case, direction will be upwards.
6. Type Extend Delta parameter: This parameter is the stroke which the plunger extends when lifting the load per cycle, giving clearance to insert two outer blocks under the spreading plate.
7. Type Retract Delta parameter: This is the distance which the plunger retracts, giving clearance to position the central blocks that will support the plunger plate for the next extension.
8. Type Preload Value: Preload value must be typed in order to ensure that the cylinder is completely in contact with the load. Type a value to ensure that every cylinder get some of pressure (5% of the load expected by each cylinder).
9. Push Start Motor button.
10. Push Start Cycle button.
11. Every cylinder will start to extend the plunger until reaching the pressure value typed in the preload section (Stage 1). When all cylinders reach preload value, the first stage is finished and operator confirmation will be required for the next step.
12. Push Start Cycle button.
13. Cylinders will be extended until reaching Positive Delta value (Stage 2). The system will require the operator confirmation for the next step.
14. Place the two outer blocks under the spreading plate.

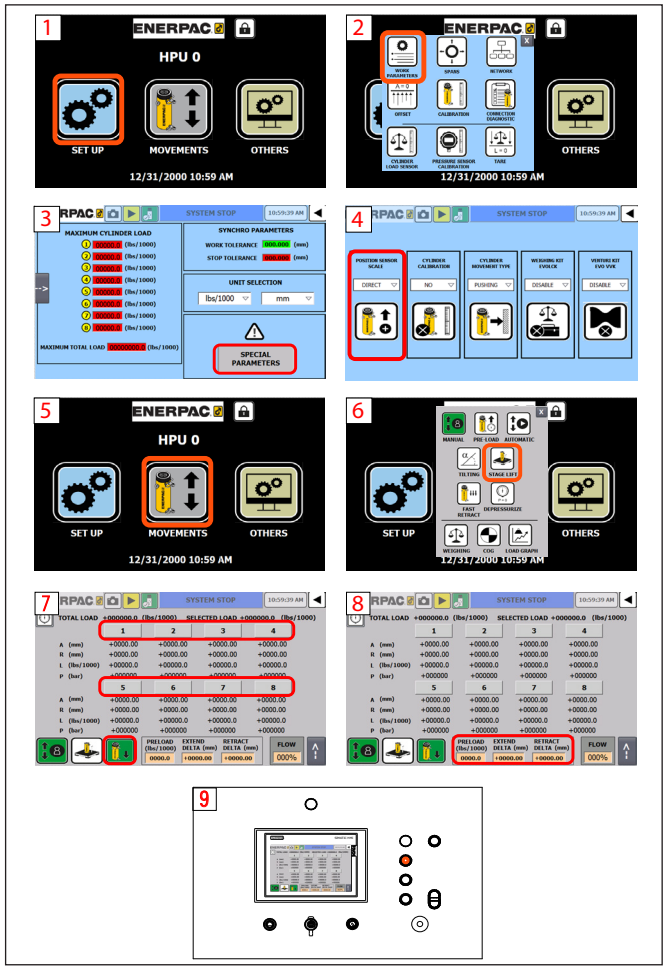

Figure 56: Stage lift procedure

⚠ WARNING

Make sure the cribbing blocks are correctly placed and that these are able to support the load. Failure on following this measures could result in death or serious personal injury and property damage.

15. Push Start Cycle button. The plunger of the cylinder will be retracted the Negative Delta value and the spreading plate of the cylinder will be supported on the outer blocks (Stage 3).
16. Push start cycle button.
17. The plunger of the cylinder will be retracted to the initial position (Stage 4).
18. Place the central blocks under the plunger to start again the sequence of the 4 stages.
19. Repeat the points 10 to 18 all the needed times to lift the load to the desired position.

NOTICE

Blocks must be placed crosswise when a new level of stacking is started.

Lowering a Load

1. Ensure that all elements are correctly plugged and does not exist any alarm.
2. In the climbing jacks, stroke sensors make a negative reading when the plunger is going out. Remember that indirect reading must be selected in this case. Refer to the section 6.3.1, Special parameters screen.
3. Go to Stage Lift screen.
4. Select Stage Lift button.
5. Select Lifting button.
6. Type Positive Delta parameter. This parameter is the stroke which the plunger extends when lifting the load per cycle, giving clearance to remove two outer blocks under the spreading plate.
7. Type Negative Delta parameter. This is the distance which the plunger retracts, giving clearance to removes the central blocks that will support the plunger plate for the next extension.
8. Type Preload Value. Preload value must be typed in order to ensure that the cylinder is completely in contact with the load. Type a value to ensure that every cylinder get some of pressure (5% of the load expected by each cylinder).
9. Remove the central blocks if it is at the same level than the outer blocks. The plunger must be retracted to do this step.
10. Push Start Motor button.
11. Push Start Cycle button.
12. Every cylinder will start to extend the plunger until reaching the pressure value typed in preload (Stage 1). When all cylinders reach preload value, the first stage is finished and operator confirmation will be required for the next step.
13. Push Start Cycle button.
14. Cylinders will be extended until reaching Positive Delta value (Stage 2). The system will require the operator confirmation for the next step.
15. Remove the two outer blocks under the spreading plate.
16. Push Start Cycle button. The plunger of the cylinder will be retracted the Negative Delta value and the spreading plate of the cylinder will be supported on the outer blocks (Stage 3).
17. Push start cycle button.
18. The plunger of the cylinder will be retracted to the initial position (Stage 4).
19. Remove the central blocks under the plunger to start again the complete cycles.
20. Repeat the points 10 to 19 all the needed times until the load is lowered to the desired position.

7.9 Depressurize Mode

After working with the system, the equipment can keep residual pressure. With work mode, the system will release the total pressure of the equipment (pumps, pipes, hoses and cylinders). Refer to paragraph 6.19 for further information.

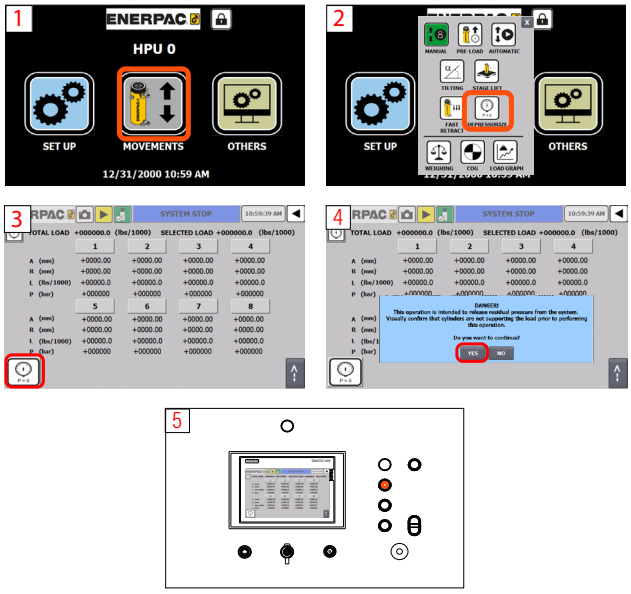

Figure 57: Depressurize mode procedure

In order to work with this mode, follow the steps below:

1. Be sure cylinders are with no load on top.
2. Go to Depressurize screen.
3. Select the Depressurize Mode button.
4. All cylinders will be selected automatically when the Depressurize Mode button is selected.
5. The system will require a second check to be sure the cylinders do not have any load. If any load is withstood by the cylinders, tap yes button. Refer to Figure 59.

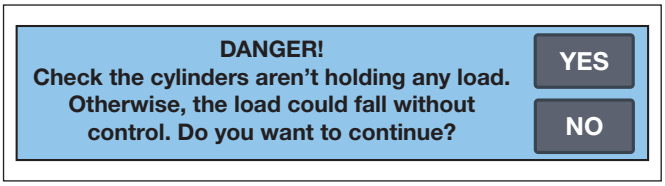

Figure 58: Warning advise for pressure releasing purposes

6. Push the Start Cycle button. The cylinders will be depressurized in seconds.

⚠ WARNING

It is totally forbidden depressurizing the system while the load is over the cylinders. If the system is pressure released with load on top of the cylinders could result in death or serious personal injury and property damage.

7.10 Fast Retract mode

This screen has been designed for those applications in which only single acting cylinders are used. When the retraction is due to gravity weight, the cylinders need more time to retract the plunger. Refer to paragraph 6.18 for further information.

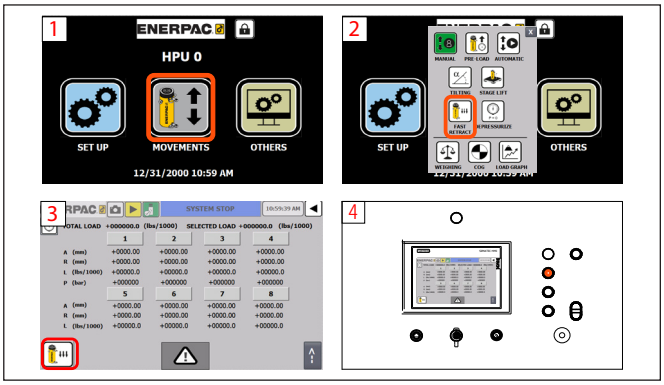

Figure 59: Fast retract procedure

⚠ CAUTION

It is important to bear in mind that with this work mode, the valves will be completely opened and will leave to oil flows to the tank free of opposition. Depending on the type of configuration of the application (cylinders, load, hoses, etc.) the load may have an incorrect speed and may cause an incident.

In order to work with this mode, follow the steps below:

1. Go to Fast Retract screen.
2. Select the cylinders that are going to be retracted.
3. Select Fast Retract button.
4. Push Start Cycle button. Hydraulic valves will be opened allowing a free return of the oil.
5. When all cylinders are retracted, push stop cycle button.

NOTICE

For a faster retract in single acting cylinders, the EVOVVK Venturi Kit can be installed. For more information concerning this kit, refer to L4591 operation manual in www.enerpac.com.

7.11 COG Tool mode

With this tool, the machine can makes the calculation of where is placed the gravity center of the load. Refer to paragraph 6.21 for further information.

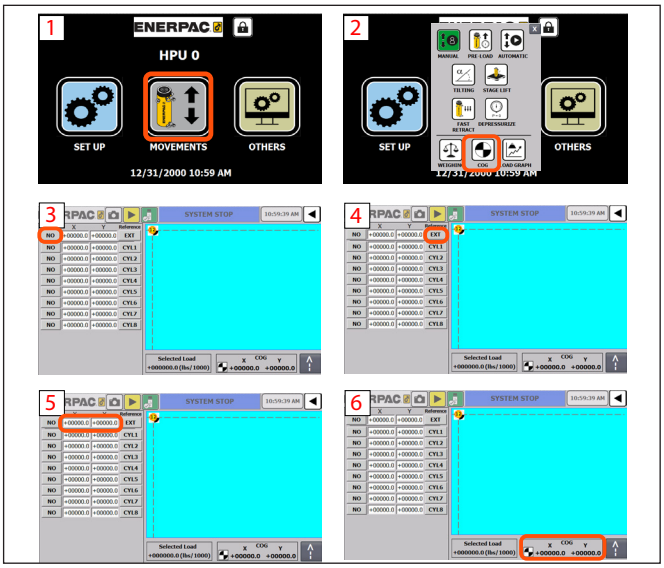

Figure 60: COG procedure

In order to work with this mode, follow the steps below:

1. Go to COG Screen.
2. Select the cylinders which will be lifting the load.
3. Select the main cylinder from which every cylinder will have the position.
4. Take the length of the position of the cylinder from the main cylinder chosen and type the position in the suitable box.
5. The system will make the calculation automatically and will show the position of all cylinders and the location of the theoretical gravity center.

7.12 Weighing mode

This is a special feature of the machine. It has the possibility of taking a reading from the load cells or pressure transducers in order to have the weight of the load.

As the load in the movement could be unstable, this work mode gives the possibility of making several readings (maximum 4 cycles) and makes the average of the readings made. Refer to paragraph 6.20 for further information.

NOTICE

To use this work mode with load cells, the EVOLCK Weighing Kit can be installed.

See in the next protocol how to take the readings of the load:

1. Ensure that every component is correctly connected and it does not trigger any alarm.
2. Go to Weighing screen.
3. Press Weighing button.
4. Type Delta Weighing parameter: Delta Weighing is the distance which the cylinder plunger must reach. This is done in order to move the load from the original status and avoid not desired forces.
5. Type Weighing Time: As when cylinders stop when load is unstable, the operator can give few seconds until load be stable an immobile. After the time typed, the system will take the reading.

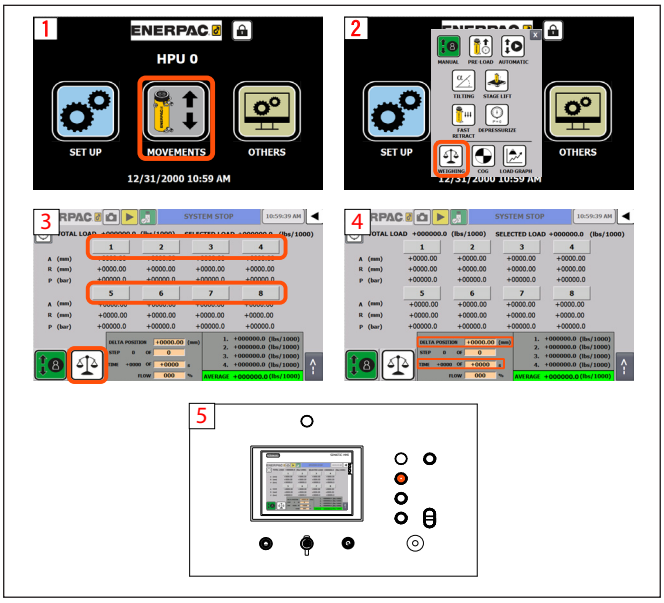

Figure 61: Weighing procedure

7.13 Performing auto-test

The system can perform an auto-test to check valves isolation, stroke sensors and flow operation. Refer to paragraph 6.30 for further information.

- **Pressure test**

With this test the system checks the hydraulic circuit:

1. Disconnect cylinders and hoses from the EVO. Close the front hinged lid to protect any projection from the hydraulic connectors.
2. Go to the Pressure Diagnostic Screen.
3. Press the Pressure Inspection button.
4. The system will require operator confirmation before continue. The user must assure that hinged lids are closed. If they are, press yes.

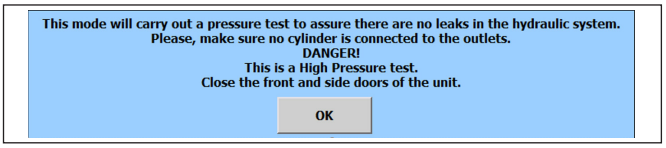

Figure 62: Warning advise for high pressure test

5. Push Start Motor button.
6. Push Start Cycle button.
7. During the next 2 minutes the system will perform the auto-test and will show the results in the screen. If something was wrong the advise will be red. Repeat the process once more and if the error come up again, contact to Enerpac Service Centre to make a deep test.

- **Stroke sensors and hose connection test:**

With this test the system can test the stroke sensor, hose connection, and the flow reached to selected cylinders.

1. Connect cylinders to the EVO
2. Connect stroke sensor to the saddle of the cylinders. Use an extension to get the wire as most vertical as possible. Cable misalignment will give mistaken readings.
3. Go to the Connection Diagnostic Screen. Refer to paragraph 6.8 for further information.
4. Select the cylinders to be tested.
5. Type a Flow for each cylinder. Cylinders will be moved with that speed.
6. Push Start Motor button.
7. Push Start Cycle button.
8. The EVO Unit will start revising the connections of all selected cylinders one by one, allowing the user to check the right connection of hoses and stroke sensors.

7.14 Controlling the hydraulic flow of A line

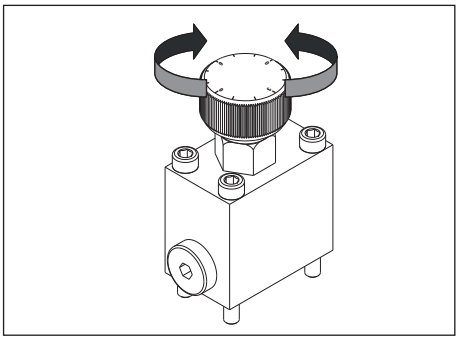

Figure 63: Detail of the flow control valve

The powerpack has flow control valves installed on top of the outlets. These valves can be used to manually control the flow of an specific outlet. This allows to change the load lowering speed by increasing or decreasing the pinch off point.

Turning in clockwise will reduce the flow for slower speeds and turning counter-clockwise will increase the oil flow, and consequently, the speed of the cylinder.

The manual adjust knob has a total of 5 full turns. The last two turns do not restrict the flow rate (see the following table). There is a reference line on the right side of the valve.

Rotation	Flow rate (lpm)
0,5	0,15
1,0	0,45
1,5	0,75
2,0	1,05
2,5	1,4
3,0	2,1
3,5	4,1
4,0	29,5
4,5	29,5
5,0	29,5

8. Maintenance

In order to anticipate any kind of breakdown, it is necessary to carry out predictive maintenance, forecasting the wear and tear of basic elements. The most important points to take into account when performing predictive maintenance are:

8.1 Check Oil Level

Check oil level of the pump prior to start-up. If necessary, add oil by removing the filling port cap.

NOTICE

Always be sure cylinders are fully retracted before adding fluid to the reservoir.

8.2 Change Oil and Clean Reservoir

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

NOTICE

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

1. Drain the complete reservoir through the draining plug placed at the bottom of the reservoir. Close the plug once the reservoir is empty.
2. Open the service lid unscrewing the bolts.
3. Thoroughly clean the reservoir and reservoir magnet with a suitable cleaning agent.
4. Change the suction filter of the low pressure pump.
5. Reassemble the service lid into the reservoir.
6. Remove the bleeder screw. Refer to paragraph 8.4 for further information.
7. Fill the reservoir with clean Enerpac hydraulic oil through the filling port. The reservoir is full when oil level is to the max. level of the top visual level, although some air is still visible.
8. Leave the pump two hours quiet to purge the air.
9. Close the pump's purge plug.

NOTICE

It is recommended that the aspiration and return filters are changed together with the oil change.

8.3 Filter cartridge replacement

The filter cartridge need to be replaced often. The return filter have an obstruction sensor that indicate on the control when the filter is dirty.

Refer to the bill of materials (in the attached documentation paragraph) to find the suitable filter reference to order to Enerpac Service Centre the adequate filter cartridge.

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

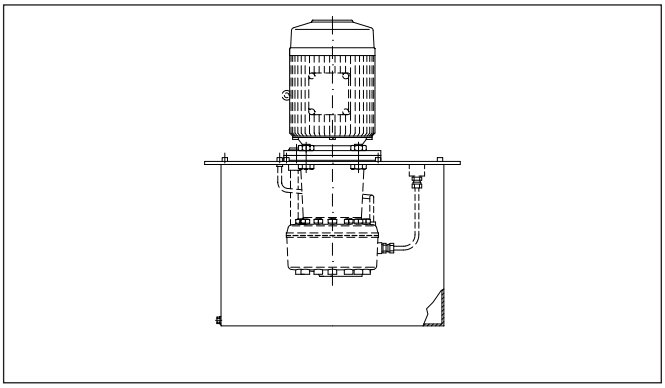

Figure 64: Motor and pump detail

8.5 Spare parts

It is recommended to have certain top quality spare parts for rapid repairs in the event of a breakdown. Below are some that should be taken into consideration:

- Spare hydraulic hoses
- Female quick couplers
- Male quick couplers
- Electrical cable
- Electrical connector
- Spare return filter
- Distribution valve
- Synchro Valves
- Flow Control Valves
- Pressure Relief Valves
- Stroke Sensors

9. Parts List

Valid only for EVO systems manufactured from January 2022.

9.1 EVO System General Parts Overview

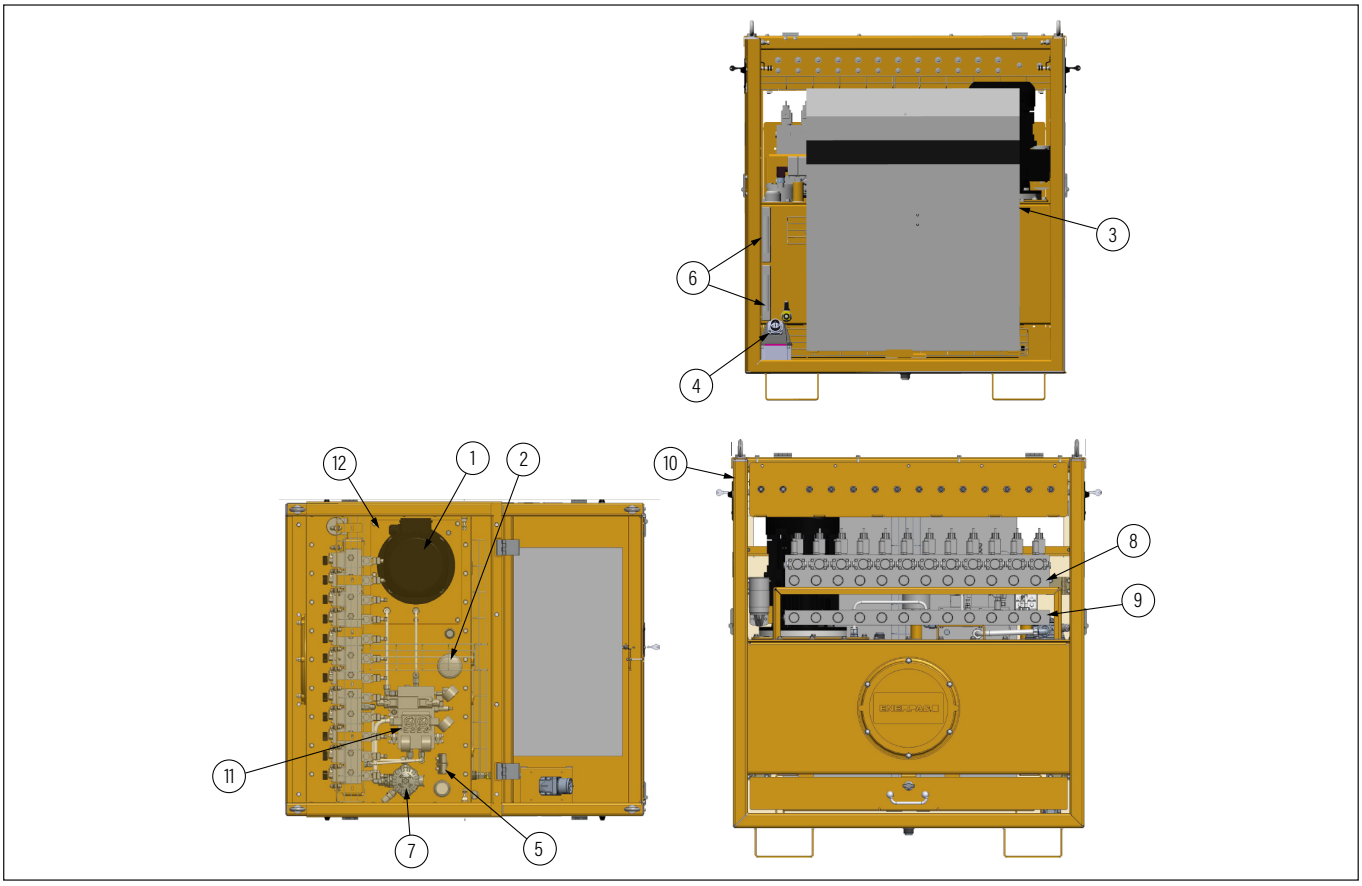

Figure 65: EVO System general parts

9.2 EVO System General Table of Parts

Item N.°	Description	Qty.	Part Number					
			EVO421380	EVO440380	EVO821380	EVO840380	EVO1221380	EVO1240380
			EVO421460	EVO440460	EVO821460	EVO840460	EVO1221460	EVO1240460
1	Electric Motor	1	DB4412259	DB4439259	DB4412259	DB4439259	DB4412259	DB4439259
2	Air Filter	1	023-H00834004	023-H00834004	023-H00834004	023-H00834004	023-H00834004	023-H00834004
3	Electric Cabinet	1	▲					
4	Power Supply Plug	1	525-6	525-6	525-6	525-6	525-6	525-6
5	Digital Level and Thermo Sensor	1	SCLTSD-520-00-07	SCLTSD-520-00-07	SCLTSD-520-00-07	SCLTSD-520-00-07	SCLTSD-520-00-07	SCLTSD-520-00-07
6	Visual Level	2	DB4184022	DB4184022	DB4184022	DB4184022	DB4184022	DB4184022
7.1	Return Filter	1	DB4389118	DB4389118	DB4389118	DB4389118	DB4389118	DB4389118
7.2	Electric Indicator	1	DB4391118	DB4391118	DB4391118	DB4391118	DB4391118	DB4391118
8	Advance Manifold	1	DB9233900	DB9233900	DB9231900	DB9231900	DB9234900	DB9234900
9	Return Manifold	1	DB9119900	DB9119900	DB9085900	DB9085900	DB9077900A	DB9077900A
10	EVO Frame	1	DB0079201-99	DB0079201-99	DB0079201-99	DB0079201-99	DB0079201-99	DB0079201-99
11	Distribution Manifold	1	DB9049900C	DB9049900C	DB9049900C	DB9049900C	DB9049900C	DB9049900C
12	Pump Subassembly	1	DB9237900	DB9239900	DB9237900	DB9239900	DB9237900	DB9239900
NOTE: ▲ The electronic parts of this item can be identified following the same procedure showed on paragraph 9.10								

9.3 Distribution Manifold Assembly

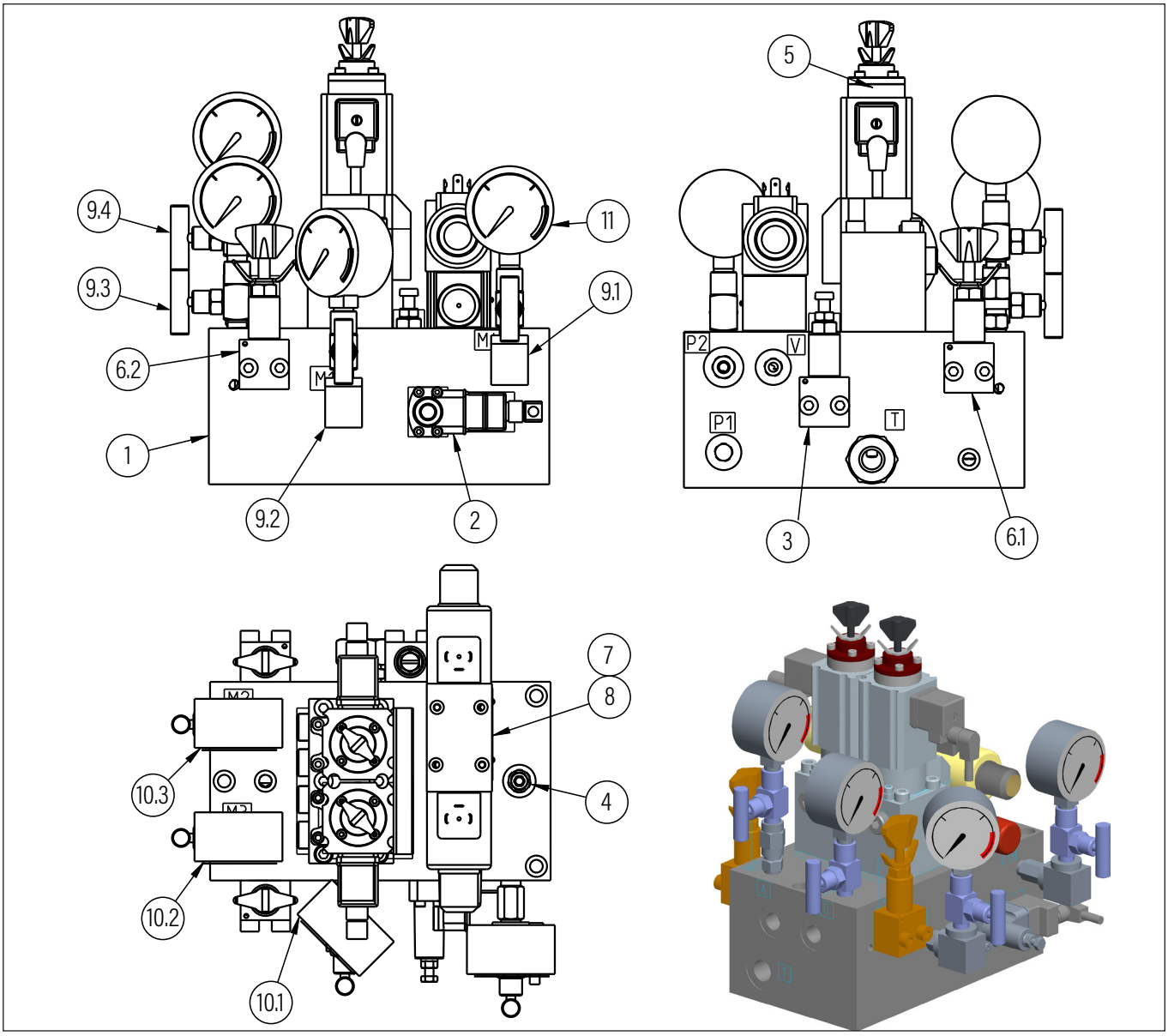

Figure 66: DB9049900C parts

9.4 Distribution Manifold Assembly Table of parts

Item N.º	Description	Qty.	Part Number
1	Manifold	1	DB5021840C
2	Pressure Switch	1	DG365
3	Relief Valve	1	MVP4A
4	Check Valve	1	RB1
5	Solenoid Valve	1	G46-22 X24/1
6	Relief Valve	2	MVP4AR
7	Relief Valve NG6	1	DB1279663
8	Directional Valve NG06 4/3 24V DC 350 bar	1	DB1278660
9	Needle Valve	4	NV251
10	Glycerine Gauge 15000 psi	3	G2536L
11	Glycerine Gauge 3000 psi	1	G2516L

9.5 Pump Sub assembly

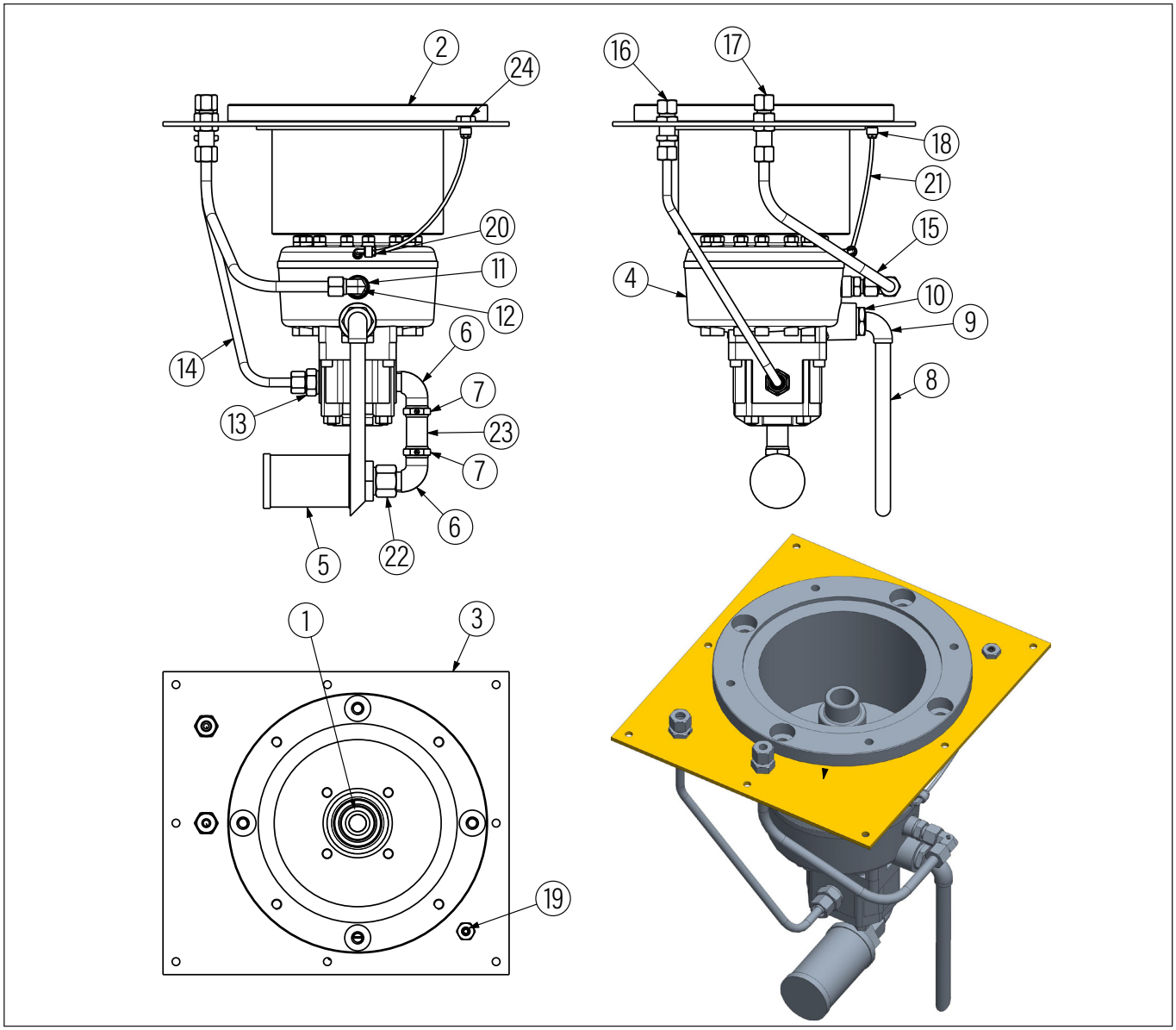

Figure 67: Pump subassembly parts

Item N.º	Description	DB9237900 (2.1 L)		DB9239900 (4,0 L)	
		Qty.	Part Number	Qty.	Part Number
1	Coupling	1	DB4659001	1	DB4642001
2	Housing	1	DB4660034	1	DB4642034
3	Motor Plate	1	DB0079020-1	1	DB0079020-2
4	Pump	1	RZ2,1/2-9	1	RZ4,0/2-9
5	Suction Filter	1	023-0025S125W	1	023-0025S125W
6	Fitting Elbow Male-Female 1/2”BSP	2	Standard Hydraulic Fitting	2	Standard Hydraulic Fitting
7	Fitting Male-Male 1/2”BSP	1	---	1	Standard Hydraulic Fitting
8	Tube 3/8” BSP	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
9	Fitting Elbow Male - Female 3/8” BSP	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
10	Fitting Reducer Male 3/4” or 1” - Female 3/8” BSP	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
11	Fitting 1/4” or 3/8” BSP to 10S	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
12	Elbow Swivel 10S	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
13	Fitting 1/2” BSP to 12L	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting

Item N.º	Description	DB9237900		DB9239900	
		Qty.	Part number	Qty.	Part number
14	Tube 12L	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
15	Tube 10S	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
16	Bulkhead 12L	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
17	Bulkhead 10S	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
18	Fitting M1/8” BSP - Tube 4 mm	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
19	Plug M1/8” BSP Conic	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
20	Elbow M6 x 1 Conic - Tube 4 mm	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
21	Tube 4 mm Plastic	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
22	Fitting Male 3/4” BSP to Female 1/2” BSP	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
23	Tube 1/2” BSP or Fitting Female-Female 1/2” BSP	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting
24	Fitting Reducer Male 1/4” BSP to Female 1/8” BSP	1	Standard Hydraulic Fitting	1	Standard Hydraulic Fitting

9.6 Advance Manifold Assembly

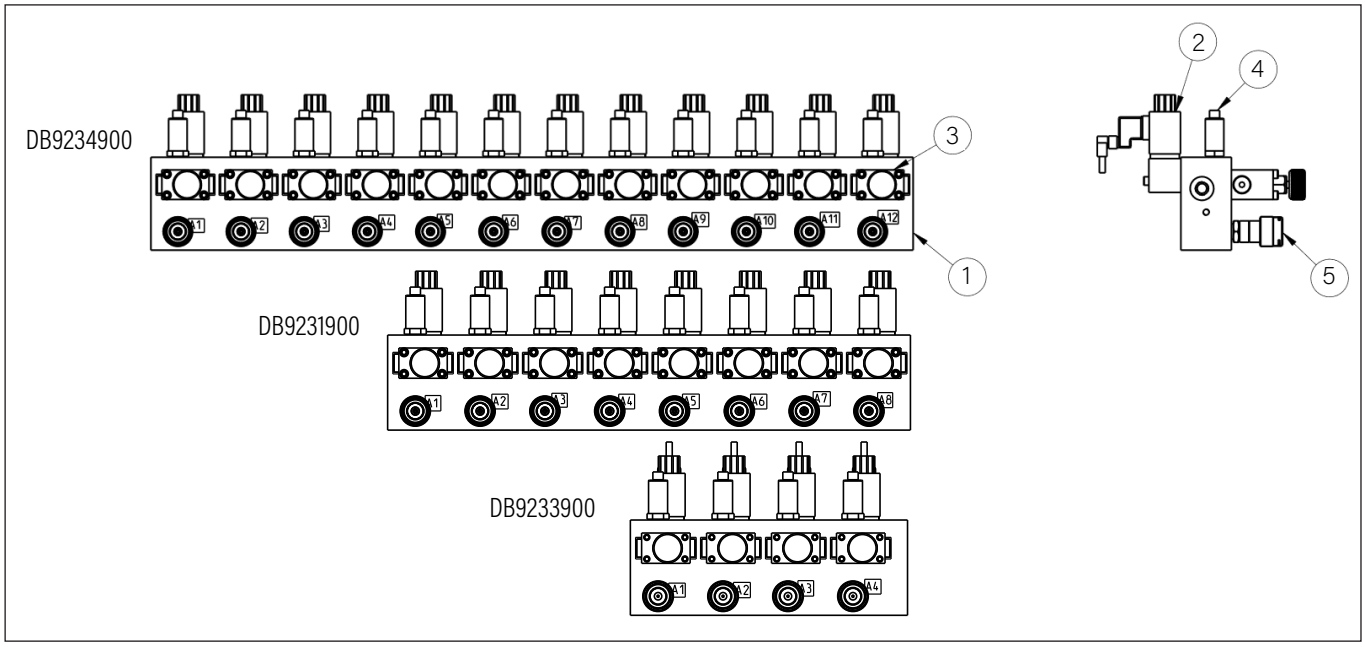

Figure 68: Advance manifold assembly parts

9.7 Advance Manifold Table of Parts

Item N.º	Description	Part Number					
		Qty.	DB9233900	Qty.	DB9231900	Qty.	DB9234900
1	Manifold	1	DB5062840	1	DB5023840A	1	DB5045840A
2	Poppet Valve	4	SK7921N-X24	8	SK7921N-X24	12	SK7921N-X24
3	Flow Control	4	DB1105662	8	DB1105662	12	DB1105662
4	Pressure Transducer	4	DB8011384	8	DB8011384	12	DB8011384
5	Female Coupler	4	CR400	8	CR400	12	CR400

9.8 Return Manifold Assembly

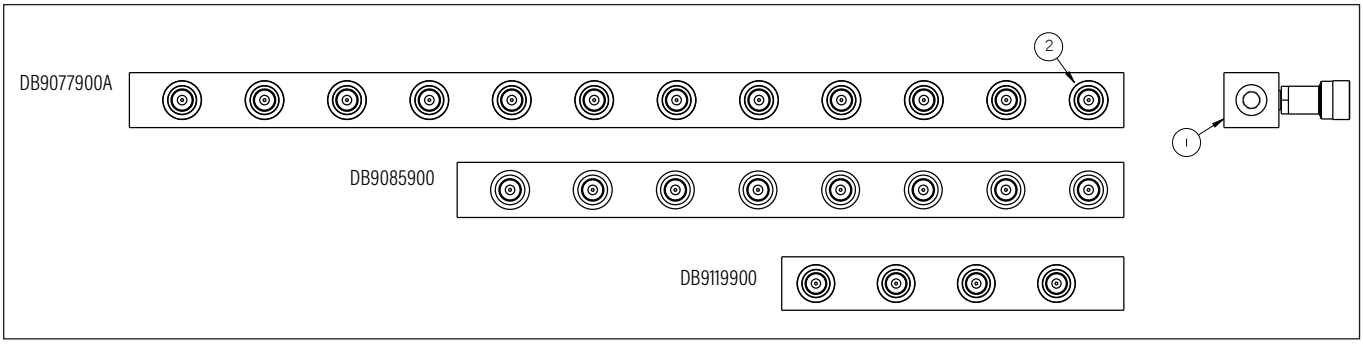

Figure 69: Return manifold assembly parts

9.9 Return Manifold Table of Parts

Item N.º	Description	DB9119900		DB9085900		DB9077900A	
		Qty.	Part Number	Qty.	Part Number	Qty.	Part Number
1	Manifold	1	DB5063840	1	DB5022840	1	DB5047840A
2	Female Coupler	4	CR400	8	CR400	12	CR400

NOTICE

The Venturi Kit is not included on the EVO package. If a supply of this kit is required, contact an Enerpac Distributor. For more information concerning this kit, refer to L4591 operation manual in www.enerpac.com

9.10 Electrical Schemes

If electrical schemes of the machine are needed, the user must contact to a Local Enerpac Distributor and provide a picture of the UL Decal located on the upper right corner of the electrical cabinet.

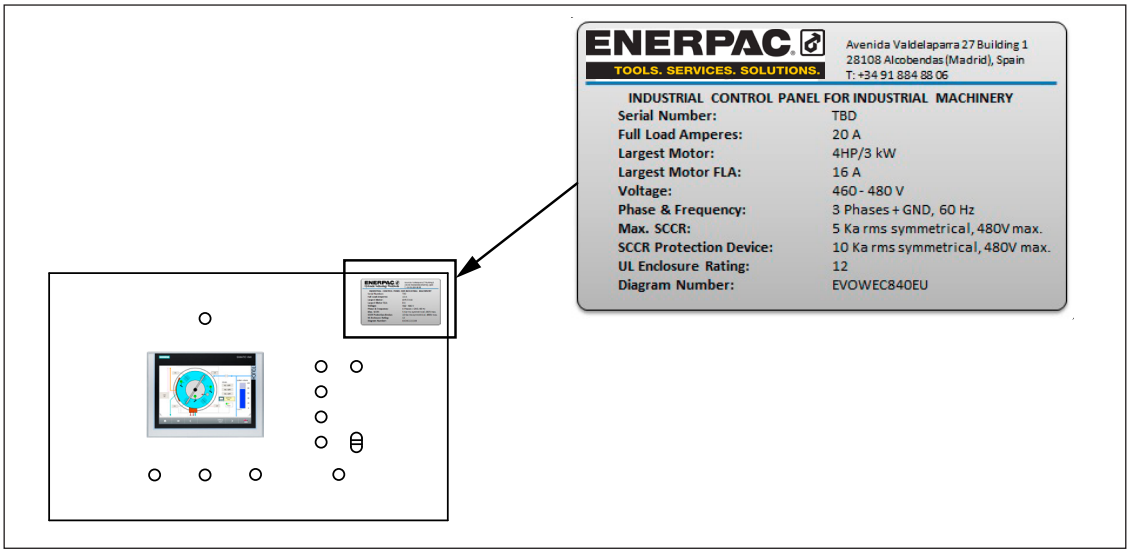

Figure 70: UL Decal

10. Hydraulic Schemes

10.1 EVO421380 Hydraulic Scheme

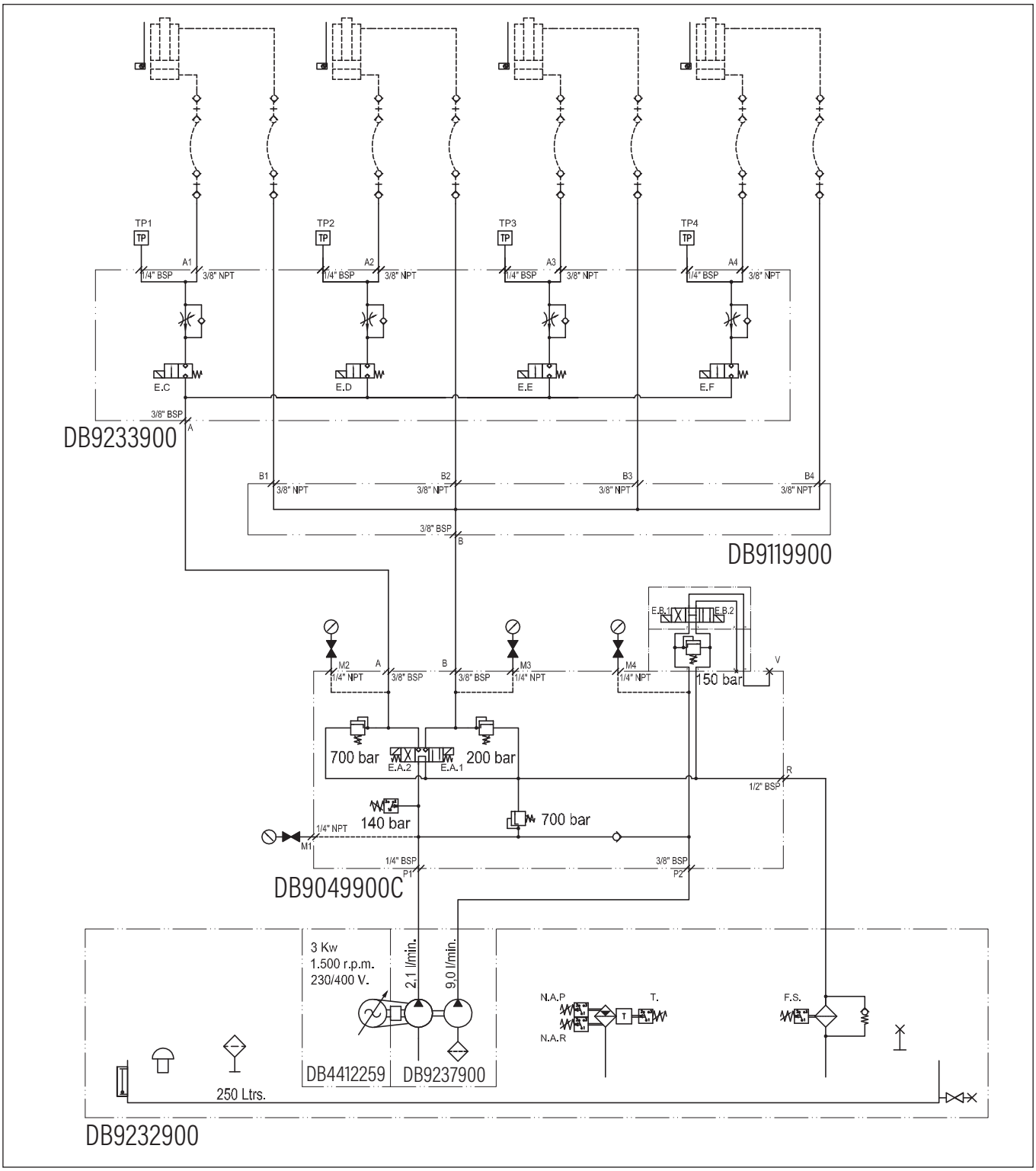

Figure 71: EVO421380 hydraulic scheme

10.2 EVO440380 Hydraulic Scheme

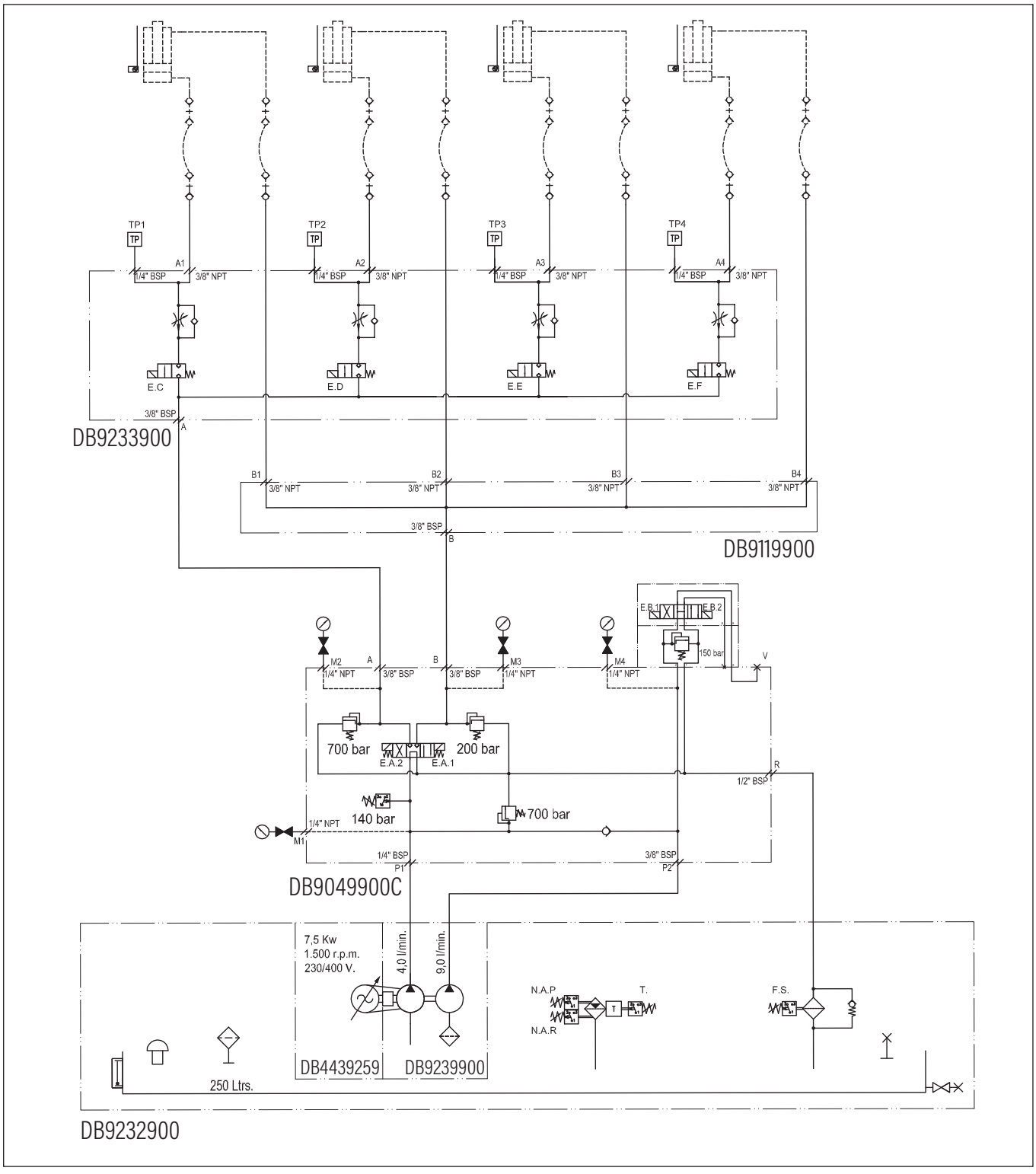

Figure 72: EVO440380 hydraulic scheme

10.3 EVO821380 Hydraulic Scheme

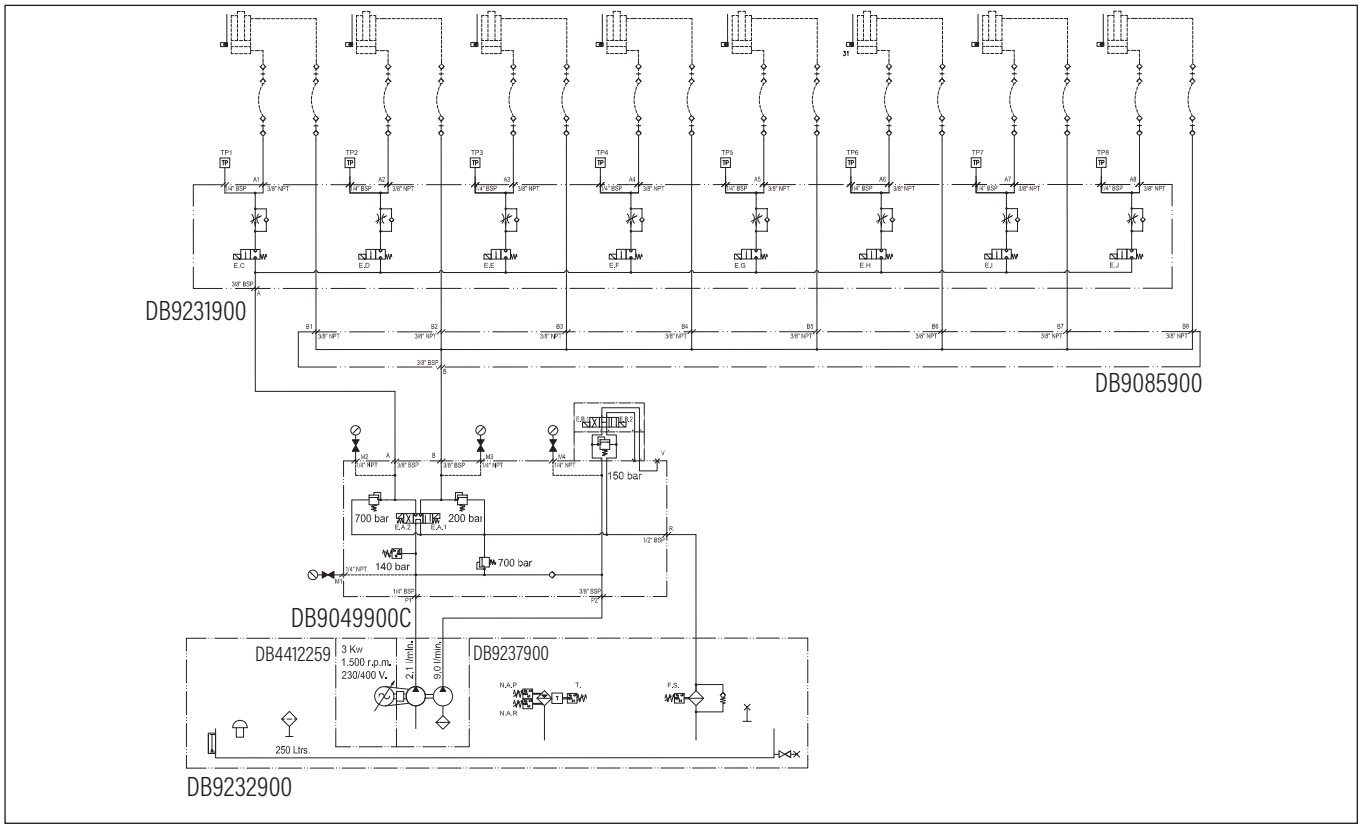

Figure 73: EVO821380 hydraulic scheme

10.4 EVO840380 Hydraulic Scheme

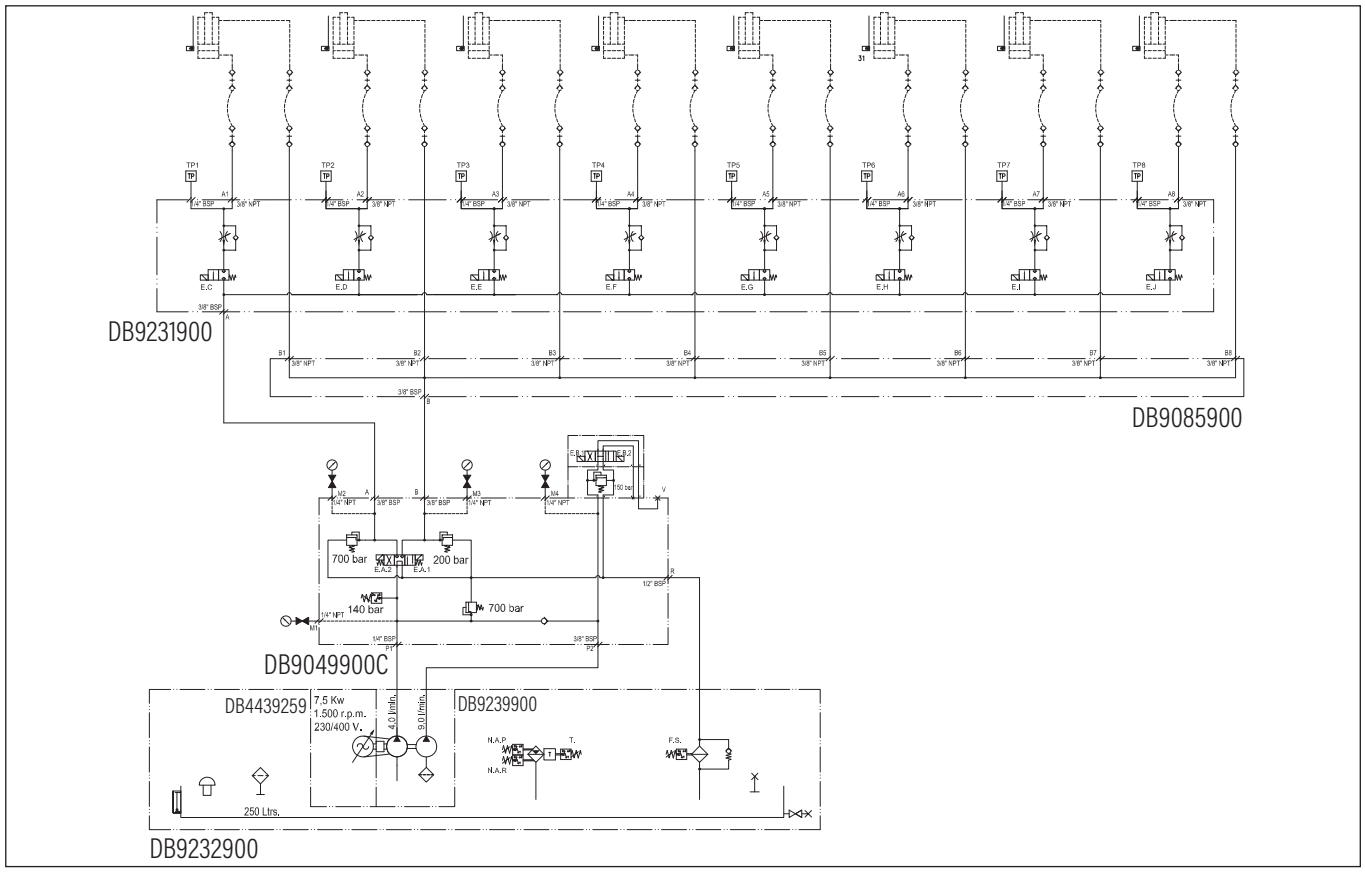

Figure 74: EVO840380 hydraulic scheme

10.5 EVO1221380 Hydraulic Scheme

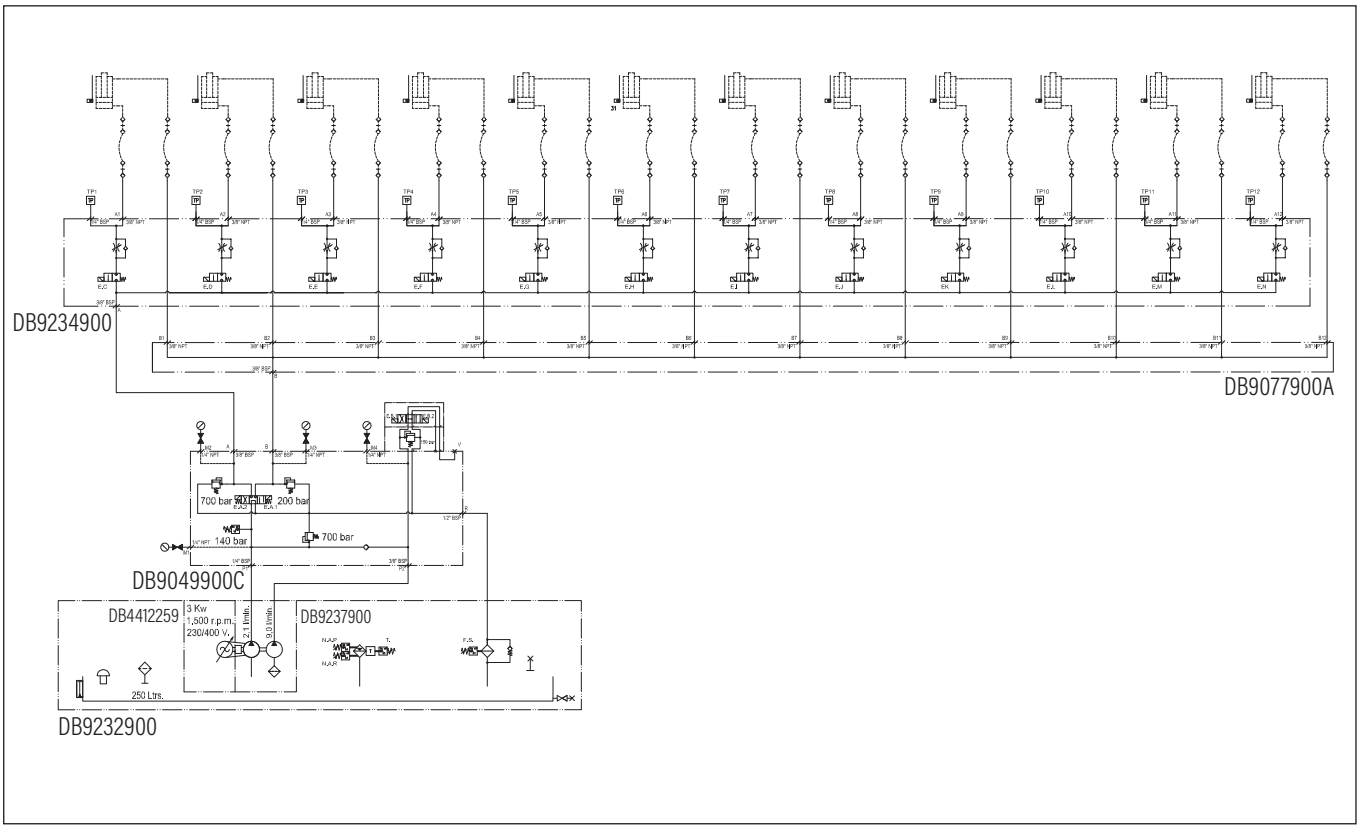

Figure 75: EVO1221380 hydraulic scheme

10.6 EVO1240380 Hydraulic Scheme

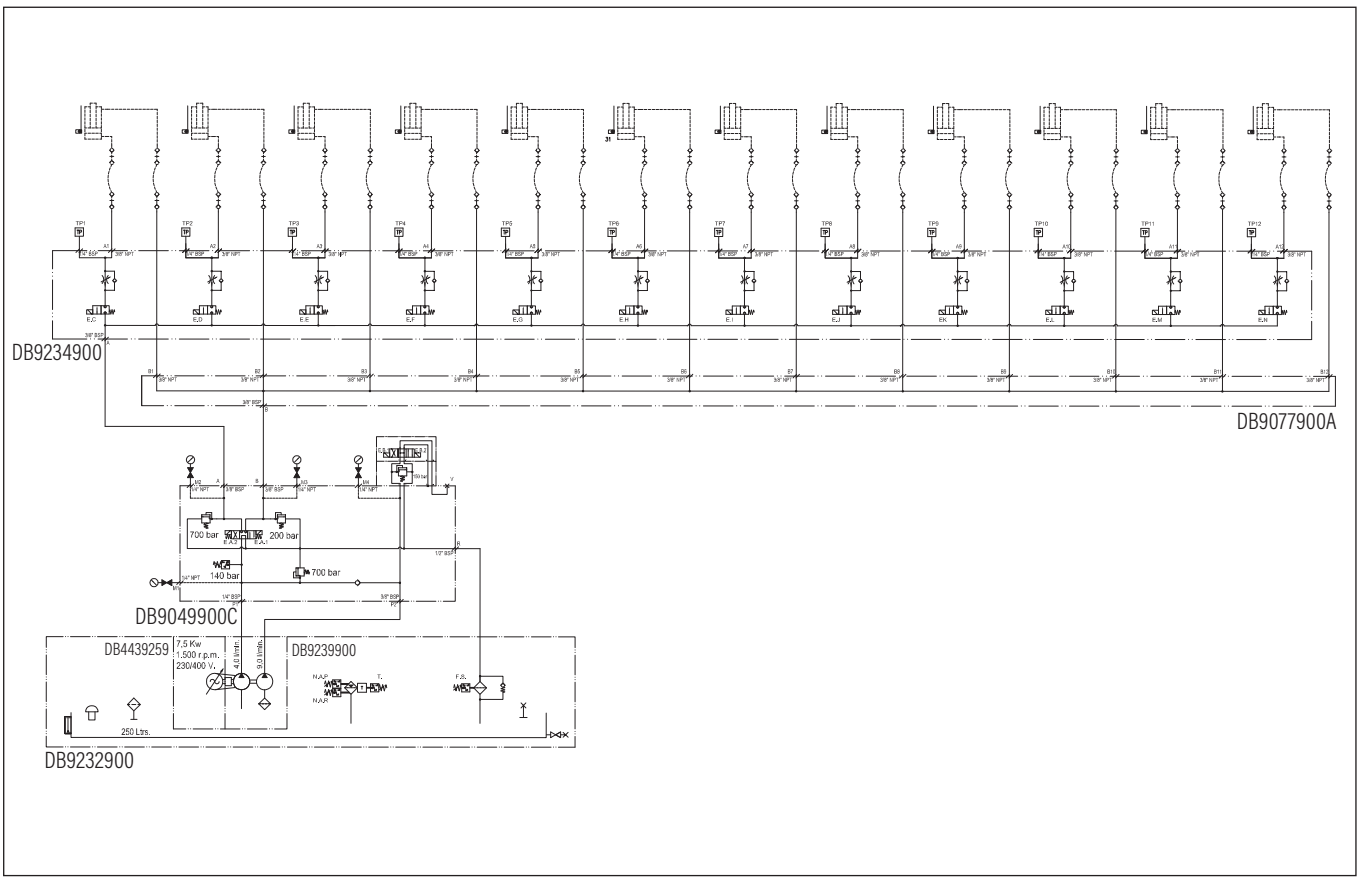

Figure 76: EVO1240380 hydraulic scheme

11. Alarm Guide

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	**POSSIBLE CAUSE**	**SOLUTION**
Safety Stop	• Safety Stop is activated.	• Deactivate Safety Stop button. • Reset alarm.
24V DC Protection Failure (#)	• The indicated (#) DC protection has been tripped, due to an excessive consumption, overheating, short circuit.	• Open the electrical cabinet and reactivate the DC protection. • Reset alarm.
Stop Oil Level	• The oil level is too low. Irreparable damage can be caused to the pump if the system is working at this level.	• Check if the oil level is low through the visual level. • If the visual level offers a different reading than the sensor, then the sensor is faulty and must be repaired. • If the oil level on the visual level is low, then refill the tank through the filling cup. • Reset alarm.
Low Oil Level	• The oil level is low.	• Check if the oil level is low through the visual level. • If the visual level offers a different reading than the sensor, then the sensor is faulty and must be repaired. • If the oil level on the visual level is low, then refill the tank through the filling cup. • When the root cause has been checked and solved, reset alarm.
Motor OFF	• A start cycle operation has been attempted with the motor off.	• Reset alarm. • Start the motor.
Frequency Inverter Failure	• Inverter Speed error.	• Push reset button in the console.
Wrong Values in Cylinder Calibration Table (#)	• The parameters in table (#) are illogical.	• Check parameters. • Reset the alarm.
Motor Overload	• The circuit breaker has been tripped, due to an excessive consumption, overheating, short circuit....	• Open the electrical cabinet and reactivate the electrical protection breaker. • Ensure that the electrical current corresponds to the characteristics of the motor. • Reset alarm.
Exceeded work Tolerance. Press Reset	• The difference between Relative Positions of selected cylinders is bigger than “Work Tolerance” parameter.	• Review the Relative Positions of selected cylinders. • Reset the Relative Positions. • Reset the alarm.
Maximum Cylinder (#) Load	• The load of the cylinder (#) has exceeded the entered value in the “Maximum working load” parameter	• Check the parameter, considering load weight and cylinder characteristics. If it is incorrect, change it. • Check “Effective Area” and “Pressure” spans. If one of them is incorrect, change it • Reset alarm. The alarm only can be reset, entering a parameter bigger than the cylinder pressure
Cylinder (#) Pressure Signal Failure	• The pressure transducer signal of the indicated (#) cylinder is not reaching to the PLC.	• Visually check the pressure transducer and the cable. • Reset alarm.

ALARM	POSSIBLE CAUSE	SOLUTION
Safety Line Failure	• In remote mode, the safety line is not correct.	• Check the safety button in all the equipments • Reset the alarm
Cylinder (#) Position Signal Failure	• The position transducer signal of the indicated (#) cylinder is not reaching to the PLC.	• Visually check the position transducer and the cable. • Reset alarm.
High Oil Temperature	• The oil has exceeded the maximum work temperature (65ºC).	• Check if the oil temperature is high through the analogue thermometer of the visual level. • If the thermometer offers a different reading than the sensor, then the sensor is faulty and must be repaired. • If the temperature on the thermometer is high, wait until the oil cools down. The machine should not be exposed to heat sources. • Reset the alarm.
Synchronization Alarm	• In “Synchronization” Mode, the difference between the positions of the fastest and the slowest cylinder is bigger than “Stop Tolerance” parameter.	• Check the parameter, considering that “Stop Tolerance” must be at least 3 times the “Work Tolerance”. If it is incorrect, change it. • If the “Tolerance” parameters are correct, reset alarm and continue the cycle. • If the alarm is activated again, visually check the state of the stroke sensor and the cylinder.
Impossible To Start Tilting. All Values Must Be Positives or Negatives	• There are negative and positive tilting values. The movement only can be in one direction.	• Adjust Deltas Positions. • Reset the alarm.
Maximum Total Load	• 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 “Effective Area” and “Pressure” spans. If one of them is incorrect, change it. • Check there is no residual pressure in points that have no cylinder installed. If there is, depressurize these points or alter “Effective Area” span, changing it to “zero”. • 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, entering a parameter bigger than the cylinder load.
Cylinder (#) Absolute Sensor Position Value Below Lowest Admissible Limit	• The Absolute Position of Cylinder (#) is near to 0 so probably is not connected.	• Visually check the position sensor and the cable. • Reset the alarm.
Clogged Return Oil Filter	• The filtering element of the return filter is clogged.	• Do not work in this state for very long periods. Working life of the pump decreases due to the contaminated oil. Replace the filtering element. • Sometimes an instant depressurization of several cylinders at the same time may cause an overpressure of the return filter and activate the alarm. Check if this is a temporary event, reset the alarm and continue working. • Reset the alarm.

NOTES

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