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<table>
<thead>
<tr>
<th>Revision</th>
<th>Description</th>
<th>Date</th>
<th>Author</th>
<th>Checked</th>
<th>Approved by</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>First release</td>
<td>19/01/2016</td>
<td>DG</td>
<td>JG</td>
<td>PC</td>
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## 1. Introduction

This is the manual for the Enerpac product that you have purchased. This manual describes how the completed system will be properly, safely operated and maintained. It covers both hardware and software.

This instruction manual applies to the Synchoist system (SHS series) with the following references:

- SHS45520MW
- SHS48520MW
- SHS411040MW
- SHS45520MJ
- SHS48520MJ
- SHS411040MJ
- SHS45540MW
- SHS48540MW
- SHS411060MW
- SHS45540MJ
- SHS48540MJ
- SHS411060MJ
- SHS45560MW
- SHS48560MW
- SHS45560MJ
- SHS48560MJ

These instructions will help you familiarize yourself with the SHS system and use the control applications as intended.

If this manual becomes unusable, in whole or in part, you can order a replacement copy by providing us with the number given on the front cover.

Enerpac reserves the right to amend this manual or update it with new information at any time at its own discretion.

This manual contains important instructions to ensure that the SHS system is used in a safe, correct and cost-effective manner. Follow these instructions to avoid dangerous situations, repairs and downtime and to extend the reliability and service life of your SHS system. Note: metric fasteners are used.

Always keep these instructions available at the worksite.

The operator and the specialized personnel responsible for maintenance must read these instructions before beginning work with the SHS system and subsequently at regular intervals.

**Note: In the rest of this manual, the SHS system is also referred to by the term “SHS”**.

The dimensions in this manual are displayed in mm/inches.

**Example: 100[3.94] = 100mm [3.94 inches]**
1.1. General information

This manual contains fundamental instructions that must be taken into consideration in preparation for transport, assembly, use and maintenance of the SHS. For this reason it is essential that all users completely read and understand this manual before working with the SHS. In addition, it must be ensured that this manual is available for future reference whenever needed.

General safety instructions are included in Chapter 2 of this manual. Additional safety instructions applicable to specific procedures and activities are included in other chapters of this manual. All safety instructions must be read and completely followed.

1.2. Manufacturer address

For further information or in cases of questions, please contact Enerpac Spain.

Enerpac Spain S.L. Phone: +34 91 884 86 06
P.I. Los Frailes nº 40 naves C y D Fax: +34 91 884 86 11
28814 Daganzo (Madrid) Email: eu.espa@enerpac.com
Spain Website: www.enerpac.com

1.3. Declaration

Declaration of conformity according to the machine Directive, for applicable standard see CE certification.

1.4. Acknowledgement

Each main component is fitted with a name plate as shown below.

The name plates are official documents and it is not permitted to alter them or render them illegible! This also applies to stickers.
1.5. Liability

As part of the risk analysis conducted by Enerpac, intended usage and reasonably foreseeable incorrect usage of the SHS were assessed. The instructions in this manual were created based on this analysis.

Users of the SHS are expected to have read and understood this manual.

In case of doubt regarding the use or application of this machine, always contact Enerpac for advice and recommendations.

Unauthorized modifications to the machine may adversely affect its properties or disrupt normal functioning. Therefore, the manufacturer shall not be liable for any claims resulting from unauthorized modifications.

1.6. Warnings and symbols

This manual uses the following warnings and symbols to draw your attention to important safety information:

<table>
<thead>
<tr>
<th><strong>Hazard</strong></th>
<th>'Hazard' is used if failure to heed the given instructions during work, assembly or similar activities may result in bodily harm or death.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Caution</strong></td>
<td>'Caution' is used if failure to heed the given instructions during work, assembly or similar activities may result in damage to the system or its components.</td>
</tr>
<tr>
<td><strong>NB</strong></td>
<td>'NB' is used to highlight important work activities or assembly procedures, or for additional information.</td>
</tr>
</tbody>
</table>

- General warning to the operator of potential damage to equipment and the environment.
- Draws the user's attention to potential hazards to personnel if work instructions are not followed precisely.
1.7. Intended use

The SHS was developed and built according to the latest technical design principles and officially recognized safety regulations. However, if the machine is not used as intended:

- This may pose a risk to the health and lives of operators and bystanders.
- The SHS may not function properly or may create hazardous situations.

The SHS should only be used if the machine is in perfect technical condition. The SHS should only be used in the intended manner (described in the instructions in this user manual) and by operators with full knowledge of the applicable safety regulations and the hazards which may arise during use.

Faults which may result in hazardous situations must be resolved immediately.

The definition of 'intended use' excludes any and all uses which do not meet the descriptions, including use that exceeds the machine's technical limitations. The manufacturer shall not accept any liability for damage resulting from use that is not in accordance with the machine's intended use. The user shall bear any and all risks. The definition of 'intended use' also includes strict compliance with the instructions in the user manual and assumes that the equipment is inspected and maintained at the indicated times.

1.8. Modifications

Never make any modifications or additions which could have an adverse impact on safety without prior approval from the manufacturer. This also applies to the installation and adjustment of safety devices and valves and welding work on the SHS.

Spare parts must always meet the technical specifications given by the manufacturer in the construction file and the component construction lists for the machine. It is recommended to use original spare parts. In cases of doubt, please contact the manufacturer.

1.9. Personnel and obligations

Only qualified personnel are allowed to operate the SHS. Always comply with legal minimum age requirements!

The SHS can only be used, maintained and repaired by properly instructed and trained personnel. Clearly describe the qualifications of the relevant employees with regard to use, commissioning, assembly, disassembly and all maintenance and repair work.

Only properly qualified personnel are permitted to perform work on the SHS. If work must be performed by third parties, they must receive clear instructions so both the client and the contractor are up-to-date on the agreements reached.

The supervisor and operator are authorized to refrain from following any instructions from third parties that may pose a risk to the machines or bystanders.
Personnel who have not been fully trained and instructed in the use of the machine, or personnel who have only received general training, may only perform work on the SHS under continuous supervision of a qualified person.

Work on the electrical system must be performed by a competent, qualified electrician or by trained personnel under the direct supervision of a qualified electrician, in compliance with all applicable rules and regulations.

Work on the hydraulic system or other components of a pressurized system must be performed by a competent, qualified installer or by trained personnel under the direct supervision of a qualified installer, in compliance with all applicable rules and regulations.

Assembly and disassembly may only be performed by trained installers under the supervision of an authorized person who has adequate knowledge of the SHS and the manual.

Maintenance & Inspection activities are specified in chapter 7 'Maintenance and Inspections' and may only be performed by trained engineers under the supervision of an authorized person who has adequate technical knowledge of the SHS and the manual.
2. Safety

This Chapter gives general safety instructions that apply when using the SHS. The SHS operates in a safe and reliable manner when the machine is used properly by trained personnel.

Because the SHS is designed to lift heavy loads, it also constitutes a potential source of danger if the instructions for safe working methods are not followed. This manual helps you prevent accidents that could result in personnel injuries and/or material damage.

Observe all general safe working methods for machines, as well as the safety regulations recommended in this manual.

2.1. General safety regulations

Special safety regulations are provided in the relevant national laws or company regulations pertaining to accident prevention. Compliance with these rules and regulations is a legal requirement and a condition of employment. In addition to the safety regulations set out under the law, also observe the following points:

1. Keep the worksite clean.
2. Before every start-up, always check that there are no persons in an unsafe situation or position with respect to the SHS.
3. Stop working if, despite warnings, there are still employees that remain in an unsafe situation.
4. Only use the SHS on an adequately stable and robust subsurface.
5. Keep all equipment out of the area of above-ground power lines.
6. The covers on the SHS must be closed or installed (this statement does not apply to the cover over the SHS control panel).
7. The operator must switch off the SHS before leaving it unattended at the worksite.
8. Use all required Personal Protection Equipment (PPE).
9. Do not wear any loose clothing or jewelry. Long hair must be tied back.
10. Use suitable tools and equipment that are in good condition for preventative maintenance and assembly and disassembly work on the SHS.
11. Keep the hydraulic and moving components of the SHS clean to prevent the SHS from jamming or causing damage to itself or other equipment.
2.2. General safety marks and labels

Always comply with the safety instructions and warnings. Make sure that the safety instructions and warnings are always in good condition and are easily readable.

You may see warning symbols in an industrial environment and/or when working with the SHS. The two tables below give descriptions of the most common used warning symbols.

*General warning symbols*

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Symbol" /></td>
<td>Danger of contact with moving machine parts</td>
</tr>
<tr>
<td><img src="image2" alt="Symbol" /></td>
<td>Lethal voltage in the control panels</td>
</tr>
<tr>
<td><img src="image3" alt="Symbol" /></td>
<td>Danger of parts of hands getting trapped/caught</td>
</tr>
<tr>
<td><img src="image4" alt="Symbol" /></td>
<td>Danger of parts of feet getting trapped/caught</td>
</tr>
<tr>
<td><img src="image5" alt="Symbol" /></td>
<td>Danger of falling</td>
</tr>
<tr>
<td><img src="image6" alt="Symbol" /></td>
<td>Exercise extreme attention and caution when under moving loads.</td>
</tr>
<tr>
<td><img src="image7" alt="Symbol" /></td>
<td>Danger of getting trapped/caught between moving parts.</td>
</tr>
</tbody>
</table>
**General mandatory symbols**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Symbol" /></td>
<td>Read the instructions/instruction manual before operation.</td>
</tr>
<tr>
<td><img src="image2" alt="Symbol" /></td>
<td>Wear gloves to prevent injury from and/or exposure to chemicals.</td>
</tr>
<tr>
<td><img src="image3" alt="Symbol" /></td>
<td>Wear safety glasses to prevent eye injuries.</td>
</tr>
<tr>
<td><img src="image4" alt="Symbol" /></td>
<td>Wear safety shoes to prevent injuries caused by falling objects and/or feet getting caught in machinery.</td>
</tr>
<tr>
<td><img src="image5" alt="Symbol" /></td>
<td>Wear hearing protection.</td>
</tr>
<tr>
<td><img src="image6" alt="Symbol" /></td>
<td>Wear a safety helmet to prevent injuries caused by falling objects.</td>
</tr>
</tbody>
</table>

### 2.3. Symbols applied to the machine

It is mandatory to observe the instructions contained on the decals and labels applied to the machine and to keep these decals and labels in fully legible condition.

### 2.4. Welding work

Welding, cutting and grinding work on the SHS is only permitted with the prior written consent of the manufacturer. Welders must be properly qualified and must have a valid welding certificate.

If welding work needs to be performed on the SHS, then the machine must be switched off and all power and communications cables must be disconnected. During welding work, a direct earth line must be available to the place to be welded.

---

**Welding, cutting, grinding or any other structural adjustment work on the SHS is not permitted without the manufacturer's prior written permission.**
2.5. Working on the electrical system

In the event of an electrical fault in the electric control system, you must bring all connected devices into a safe condition.

Work on the devices must be performed by a competent, qualified electrician or by trained personnel under the direct supervision of a qualified electrician, in compliance with all applicable rules and regulations, in compliance with all applicable rules and regulations (such as Netherlands standard NEN 3140: ‘Operation of electrical installations - Low voltage’ and/or international standard NEN-EN 50110-1: ‘Operation of electrical installations’).

Switch the power off before inspection, maintenance or repair of the SHS. Make sure that the relevant parts are no longer receiving power. If possible, make a connection to earth. Insulate any adjacent components that are still receiving power.

Check and inspect the electrical system of the SHS at regular intervals. Problems, such as loose connections and damaged or stuck wiring, must be resolved immediately. Only use original fuses and circuit breakers with the correct current value.

If work does need to be performed on components receiving power, then a second person must be present in the area to switch off the main power switch in the event of an emergency. Cordon off the work zone and only use certified and properly insulated tools.

2.6. Working on the hydraulic system

Check all pipes, hoses, quick-release couplings and screw joints regularly for leaks and visible external damage. Have any damage repaired immediately. Pressurized hydraulic fluid leaks may cause (serious) injury, fire and damage to the environment. If parts need to be removed from the hydraulic system, the hydraulic pressure must be released according to the instructions in this manual before beginning work.

Hazard

Any components that are blocked or stuck in any way (and any parts connected to these components) will be under mechanical tension. If you release these parts, they could change position suddenly serious injury could result..

Expand and install pressurized hydraulic pipes, tubes and lines in accordance with professional standards. Make certain that no ports have been switched and the length and quality of hoses must meet the requirements of ‘NEN-EN-ISO 4413: hydraulics- General rules and safety requirements for systems and their components’.
2.7. Working in extreme temperatures

If body parts come in contact with hot or cold surfaces, heat transfer will occur (burning or freezing, respectively). In both cases, this may result in burn wounds.

Potential hazards of high temperatures are:
- Burn wounds on parts of the body
- Expansion and deformation of materials
- Accelerated combustion of combustible substances
- Pressure increases due to expansion of gases and liquids

Potential hazards of low temperatures are:
- Hypothermia or freezing of parts of the body
- Materials becoming brittle and breaking more easily
- Skin freezing and sticking to cold surfaces
- Liquids may freeze, causing blockages.

The SHS is subject to limitations when working in extreme temperatures.

**Temperature limitations**

<table>
<thead>
<tr>
<th>Ambient temperature:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature at standstill</td>
<td>0°C  to  +50°C [32°F to 122°F]</td>
</tr>
<tr>
<td>Temperature when in operation</td>
<td>0°C  to  +50°C [32°F to 122°F]</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20°C to 50°C [-4°F to 122°F]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature of hydraulic oil:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum oil temperature for system startup</td>
<td>0°C  [-4°F]</td>
</tr>
<tr>
<td>Oil temperature when in operation</td>
<td>+10°C  to  +60°C [50°F to 140°F]</td>
</tr>
</tbody>
</table>

2.8. Fire

The course of action in the event of an emergency is determined by the rules and regulations applicable on the worksite. Every company has its own special rules. So make certain you are up-to-date on these rules.

In any case, the following actions are necessary in the event of a fire:
- Report the emergency to the employee responsible for in-house emergency services (IHES).
- The IHES employee will notify external emergency services.
- When you report an emergency, report who you are and where you are located and describe the emergency situation.
- Extinguish any small fires that are still in their early stages using the extinguishing means available onsite.
- If possible, switch off the electrical power supply.
- Warn your colleagues.
- Leave the scene of the emergency situation and report to the designated emergency meeting point.
• Do not panic

![Hazard]

Hazard
Never use water to put out an electrical fire or a fluid fire.

2.9. Working with hazardous substances

Most people think that special first aid procedures are required in cases of accidents with chemicals. Actually though, in cases of small quantities, standard measures typically suffice: rinse thoroughly with water, wash with soap, fresh air and remove any contaminated clothing:
- Contact with the skin: rinse thoroughly with water, remove any contaminated clothing and wash the relevant body parts with soap.
- Contact with the eyes: rinse thoroughly with water (5 minutes) using eye wash fountain, then consult a doctor.
- Ingestion: rinse the mouth out with water. If necessary, dilute the substance by drinking water. If a corrosive substance has been ingested, do not induce vomiting. This is to prevent the substance coming into contact with the sensitive esophagus again. If the victim is unconsciousness, never attempt to induce vomiting or have the victim drink anything.

Using a ‘neutralizing solution’ (such as a base for an acid) can actually make the situation worse. In addition to this, it is advisable to consult the safety information (TREMCARD book, safety information sheets and the catalogue) and report everything that is relevant to the accident to a physician.

Make sure that the safety regulations are observed when working in enclosed spaces. For instance, wear personal protection equipment, ventilate according to the relevant regulations and ask a colleague to remain by the entrance in order to provide assistance in the event of an emergency.

2.10. Safety information sheets

You are legally required to be familiar with the potential hazards of a product. The safety information sheets are intended to provide adequate, correct and up-to-date information on all substances used on the worksite.

The supplier of a substance or preparation is legally required to provide professional users with an adequate safety information sheet (SIS) (Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)).

Relevant safety information sheets are given in paragraph E of this manual.

2.11. Hazard symbols according to CLP/GHS

CLP is the Regulation on Classification, Labelling and Packaging of substances and mixtures (EC No 1272/2008). This regulation brings European legislation on the classification, labelling and packaging of chemical substances into accordance with the GHS (Global Harmonized System for classification and labelling of chemical substances).
substances). The GHS is a United Nations system used to identify chemical substances and inform users of their hazards using standard symbols and phrases on labels, packaging and Safety Information Sheets (SIS).

During maintenance, you may work with substances fitted with GHS symbols. These GHS symbols are explained in the table below.

**General symbols according to the GHS**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>General hazard indication</th>
<th>Possible precautionary measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Symbol]</td>
<td>May cause an allergic reaction on the skin.</td>
<td>Contaminated work clothing must not leave the workspace.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Harmful to aquatic organisms, with long term effects</td>
<td>Do not discharge into the environment.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Causes serious eye injury and/or damage to the skin.</td>
<td>Wear eye protection and skin protection (such as protective gloves).</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Fire hazard when heated and/or in presence of sparks.</td>
<td>Keep away from heat, sparks, open flames and/or hot surfaces. No smoking!</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>May cause fire (oxidizing agent).</td>
<td>Take the necessary precautionary measures to prevent mixture with flammable substances.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Toxic in cases of ingestion and/or skin penetration</td>
<td>Do not eat, drink or smoke when using this product.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>May cause hypersensitivity of the airways or heritable mutations in male reproductive cells, is a potential carcinogen and/or is toxic to human reproduction</td>
<td>Apply a strict hygiene/health policy and wear suitable personal protection equipment.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Explosion hazard when heated and/or in presence of sparks</td>
<td>Keep away from heat, sparks, open flames and/or hot surfaces. No smoking!</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Contains a gas under pressure. May explode if heated</td>
<td>Keep out of sunlight. Store in a well-ventilated space.</td>
</tr>
</tbody>
</table>

**2.12. Assembly and disassembly**

Lifting and hoisting work must be performed by trained operators with certified lifting and hoisting equipment. Before use, check the validity of these certificates and qualifications.
During assembly and disassembly, only use lifting and hoisting equipment with adequate capacity for the loads in question. The lifting and hoisting equipment must be stable enough and have suitable lifting and hoisting capacity.

Always have assembly and disassembly work performed by properly trained personnel.

Lift loads as described in the user manual (connection points for lifting hooks) and observe the professional standards.

Make sure that the instructions in this manual have been followed precisely before commissioning the SHS.

2.13. Transport

Lifting and hoisting work must be performed by trained operators with certified lifting and hoisting equipment. Before use, check the validity of these certificates and qualifications.

For loading and unloading, only use lifting and hoisting equipment of adequate capacity for the loads in question. The lifting and hoisting equipment must be stable enough and have suitable lifting and hoisting capacity.

Loading and offloading should always be performed by properly trained personnel.

Lift loads as described in the user manual (connection points for lifting hooks) and observe the professional standards.

Only use suitable containers with adequate load-bearing capacity for transport purposes. Secure the load properly using suitable connection points and twist locks (for the containers). When using twist locks secure them properly and check that the locking mechanism is working correctly.

Disconnect any power connections (electrical or hydraulic) in advance, even if the SHS only needs to be moved a short distance.

It is very important that the system is not damaged during transport. Use timbers, rubber and plastic packaging to help prevent damage from occurring. The equipment can be transported in a container. This provides good protection against weather influences and gives a good rigid protection. Make sure that all parts are secured against sliding around.
3. **System overview**

This chapter describes the main components of the SHS. The dimensions, weights and numbers are described for a SHS. For clarification, a photo of the part is given next to each description. The chapter is divided in two parts. One is for SHP (the powerpack of the system) and the other is for SHC (the Synchoist cylinder).

### 3.1. General description of the SHS

The SHS is a below-the-hook device which is typically comprised of multiple specialized hydraulic cylinder and valve combinations mounted directly in-line with the rigging which provides an operator the freedom to precisely monitor and adjust each lifting point independently. The use of optional integrated cylinder stroke sensors and pressure transducers at each lifting point allow for position and load feedback at the operator control station. Optional PLC controls deliver operator safety while the intelligent hydraulics monitor and guide the compact hydraulic cylinders.

The use of integrated cylinder pressure transducers at each lifting point allow for load feedback at the operator display station.

Accurate hoisting and load positioning enhance the capability of a single crane. With the use of a single crane, the load can be precisely maneuvered in a vertical and horizontal plane. Utilizing a single crane reduces risk and cost, and vastly improves operating speed and worker safety. A single crane also reduces the risk of damage from oscillations of wire rope due to sudden crane starts/stops.

The SHS can be used for tilting, aligning and high precision horizontal and vertical load positioning. The following table shows the characteristics of the manual SHS.

<table>
<thead>
<tr>
<th>Set Model Number</th>
<th>Pump model Number</th>
<th>Electric option</th>
<th>Motor Size (kW)/hp</th>
<th>Pump Outlets x Flow (l/min) / inch3/min</th>
<th>Motor Voltage (V-ph-Hz)</th>
<th>Cylinder Stroke (mm)/inches</th>
<th>Cylinder model</th>
<th>Control System</th>
<th>Oil Capacity (litres)/gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHS45520M</td>
<td>SHP414M</td>
<td>W</td>
<td>7.5 /10.2</td>
<td>4 x 1.4/85.43</td>
<td>400-3-50</td>
<td>4 x 55 (539)</td>
<td>500/20</td>
<td>SHC5520</td>
<td>Manual 200/53</td>
</tr>
<tr>
<td>SHS45540M</td>
<td></td>
<td>J</td>
<td>9 /12.24</td>
<td>4 x 1.7/103.7</td>
<td>480-3-60</td>
<td>1500/60</td>
<td>SHC5540</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHS45560M</td>
<td></td>
<td>J</td>
<td>9 /12.24</td>
<td>4 x 1.7/103.7</td>
<td>480-3-60</td>
<td>1500/60</td>
<td>SHC5560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHS48520M</td>
<td>SHP421M</td>
<td>W</td>
<td>11 /14.96</td>
<td>4 x 2.1/128.1</td>
<td>400-3-50</td>
<td>4 x 85 (833)</td>
<td>500/20</td>
<td>SHC8520</td>
<td>Manual 200/53</td>
</tr>
<tr>
<td>SHS48540M</td>
<td></td>
<td>J</td>
<td>13.2 /17.95</td>
<td>4 x 2.5/152.6</td>
<td>480-3-60</td>
<td>1500/60</td>
<td>SHC8540</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHS48560M</td>
<td></td>
<td>J</td>
<td>13.2 /17.95</td>
<td>4 x 2.5/152.6</td>
<td>480-3-60</td>
<td>1500/60</td>
<td>SHC8560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHS411040M</td>
<td></td>
<td>W</td>
<td>11 /14.96</td>
<td>4 x 2.1/128.1</td>
<td>400-3-50</td>
<td>4 x 110 (1078)</td>
<td>1000/40</td>
<td>SHC1140</td>
<td></td>
</tr>
<tr>
<td>SHS411060M</td>
<td></td>
<td>J</td>
<td>13.2 /17.95</td>
<td>4 x 2.5/152.6</td>
<td>400-3-60</td>
<td>1500/60</td>
<td>SHC1160</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following tables show the characteristics of the cylinders:

### CYLINDER FEATURES 55 tons

<table>
<thead>
<tr>
<th>Feature</th>
<th>SHC5520</th>
<th>SHC5540</th>
<th>SHC5560</th>
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<tbody>
<tr>
<td>Pushing pressure</td>
<td>125 bar</td>
<td>1800 psi</td>
<td></td>
</tr>
<tr>
<td>Pushing capacity</td>
<td>18.2 Ton</td>
<td>18.2 Ton</td>
<td></td>
</tr>
<tr>
<td>Pulling pressure</td>
<td>700 bar</td>
<td>10000 psi</td>
<td></td>
</tr>
<tr>
<td>Pulling capacity</td>
<td>56.78 Ton</td>
<td>56.78 Ton</td>
<td></td>
</tr>
<tr>
<td>External diameter</td>
<td>245 mm</td>
<td></td>
<td>9.64 in</td>
</tr>
<tr>
<td>Internal diameter</td>
<td>135 mm</td>
<td></td>
<td>5.31 in</td>
</tr>
<tr>
<td>Plunger diameter</td>
<td>90 mm</td>
<td></td>
<td>3.54 in</td>
</tr>
<tr>
<td>Pushing effective area</td>
<td>143.1 cm$^2$</td>
<td></td>
<td>22.18 in$^2$</td>
</tr>
<tr>
<td>Pulling effective area</td>
<td>79.5 cm$^2$</td>
<td></td>
<td>12.32 in$^2$</td>
</tr>
<tr>
<td>Area ratio</td>
<td>1.80</td>
<td>1.80</td>
<td></td>
</tr>
<tr>
<td>Pushing chamber capacity</td>
<td>7.16 l.</td>
<td>1.89 gal.</td>
<td>14.3 l.</td>
</tr>
<tr>
<td>Pulling chamber capacity</td>
<td>3.98 l.</td>
<td>1.05 gal.</td>
<td>7.9 l.</td>
</tr>
<tr>
<td>Stroke</td>
<td>500 mm</td>
<td>19.68 in</td>
<td>1000 mm</td>
</tr>
<tr>
<td>Net drained weight</td>
<td>476 Kg</td>
<td>1049 lbs</td>
<td>624 Kg</td>
</tr>
</tbody>
</table>

### CYLINDER FEATURES 85 tons

<table>
<thead>
<tr>
<th>Feature</th>
<th>SHC8520</th>
<th>SHC8540</th>
<th>SHC8560</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushing pressure</td>
<td>125 bar</td>
<td>1800 psi</td>
<td></td>
</tr>
<tr>
<td>Pushing capacity</td>
<td>25.6 Ton</td>
<td>25.6 Ton</td>
<td></td>
</tr>
<tr>
<td>Pulling pressure</td>
<td>700 bar</td>
<td>10000 psi</td>
<td></td>
</tr>
<tr>
<td>Pulling capacity</td>
<td>87.5 Ton</td>
<td>87.5 Ton</td>
<td></td>
</tr>
<tr>
<td>External diameter</td>
<td>265 mm</td>
<td></td>
<td>10.5 in</td>
</tr>
<tr>
<td>Internal diameter</td>
<td>160 mm</td>
<td></td>
<td>6.3 in</td>
</tr>
<tr>
<td>Plunger diameter</td>
<td>100 mm</td>
<td></td>
<td>4 in</td>
</tr>
<tr>
<td>Pushing effective area</td>
<td>201.1 cm$^2$</td>
<td></td>
<td>31.17 in$^2$</td>
</tr>
<tr>
<td>Pulling effective area</td>
<td>122.5 cm$^2$</td>
<td></td>
<td>19 in$^2$</td>
</tr>
<tr>
<td>Area ratio</td>
<td>1.64</td>
<td>1.64</td>
<td></td>
</tr>
<tr>
<td>Pushing chamber capacity</td>
<td>10.05 l.</td>
<td>2.65 gal.</td>
<td>20.11 l.</td>
</tr>
<tr>
<td>Pulling chamber capacity</td>
<td>6.13 l.</td>
<td>1.62 gal.</td>
<td>12.25 l.</td>
</tr>
<tr>
<td>Stroke</td>
<td>500 mm</td>
<td>19.68 in</td>
<td>1000 mm</td>
</tr>
<tr>
<td>Net drained weight</td>
<td>531 Kg</td>
<td>1171 lbs</td>
<td>700 Kg</td>
</tr>
</tbody>
</table>
## CYLINDER FEATURES 110 tons

<table>
<thead>
<tr>
<th>Feature</th>
<th>SHC11040</th>
<th>SHC11060</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushing pressure</td>
<td>125 bar</td>
<td>1800 psi</td>
</tr>
<tr>
<td>Pushing capacity</td>
<td>36.1 Ton</td>
<td>36.1 Ton</td>
</tr>
<tr>
<td>Pulling pressure</td>
<td>700 bar</td>
<td>10000 psi</td>
</tr>
<tr>
<td>Pulling capacity</td>
<td>114.8 Ton</td>
<td>114.8 Ton</td>
</tr>
<tr>
<td>External diameter</td>
<td>315 mm</td>
<td>12.40 in</td>
</tr>
<tr>
<td>Internal diameter</td>
<td>190 mm</td>
<td>7.48 in</td>
</tr>
<tr>
<td>Plunger diameter</td>
<td>125 mm</td>
<td>4.92 in</td>
</tr>
<tr>
<td>Pushing effective area</td>
<td>283.5 cm²</td>
<td>49.94 in²</td>
</tr>
<tr>
<td>Pulling effective area</td>
<td>160.8 cm²</td>
<td>24.92 in²</td>
</tr>
<tr>
<td>Area ratio</td>
<td>1.76</td>
<td>1.76</td>
</tr>
<tr>
<td>Pushing chamber capacity</td>
<td>28.35 l</td>
<td>7.49 gal.</td>
</tr>
<tr>
<td>Pulling chamber capacity</td>
<td>16.08 l</td>
<td>4.25 gal.</td>
</tr>
<tr>
<td>Stroke</td>
<td>1000 mm</td>
<td>39.37 in</td>
</tr>
<tr>
<td>Net drained weight</td>
<td>970 Kg</td>
<td>2138 lbs</td>
</tr>
</tbody>
</table>

Document number: L16004201
4. **Assembly of the SHS**

This chapter provides detailed information about preparing the SHS for use. The preparations that must be made for the working location, the SHS etc. are described in this chapter.

4.1. **Storage**

For storage of the SHS, there is a difference between temporary storage and storage for a long period. If you intend to store the system for a longer period, a dry and preferably closed space is recommended.

During short-term storage, especially in the open air, cover the units with a tarpaulin in order keep electrical and other moisture-sensitive components dry.

4.2. **Lifting the SHS**

The frame has four hoisting eyes for lifting with cranes. The frames are modular and stackable as showed in the annex A.
4.3. Making Hydraulic Connections

This chapter describes the required hydraulic connections for the SHS.

**WARNING:** On double-acting cylinders be certain that hoses are connected to BOTH couplers. Never attempt to pressurize a double-acting cylinder if only one hose is connected.

**IMPORTANT:** To relieve hydraulic pressure behind the ports prior to connecting hoses, move the manual valve several times back and forth between the advance and retract positions, with the motor switched off (manual valves). For solenoid valves turn the handle clockwise completely on every valve as shown in the picture below (make sure to unlock the locknut) and leave the valves deactivated.

For installation of the Synchoist cylinders, it is not necessary to start-up the power pack.

Operation of cylinders will be explained later in case it may be necessary to move them to hang them on the rigging structure.

It is advisable to connect the hoses with the cylinders retracted and in the horizontal position (that is why it is not necessary to start-up the system prior to installation). If hoses are connected with cylinders in the vertical position it may be impossible to connect the hose in the small chamber due to pressure created by plunger weight.

Connect the hydraulic hoses as follows.

- Port A to the retract side or rod side of the cylinder
  - The "A" port controls the pulling and load holding side of the cylinder.

- Port B to the advance side or base side of the cylinder.
  - The "B" port controls the extend side of the cylinder.

Perform the following steps to correctly connect the hoses:

1. Keep cylinder connected to a hydraulic system with a fluid cleanliness level minimum of NAS 1638 Class 6.
2. Remove dust covers/rubber plugs from oil ports
3. Inspect all threads and fittings for signs of wear or damage and replace as needed.
4. Clean all threads and fittings.
5. Make hydraulic connections for double-acting cylinders using two hoses.
6. Fully hand-tighten all couplers. Loose coupler connections will block the flow of oil between the pump and the cylinder.
7. Check for leaks in system and have repaired by qualified personnel.
**IMPORTANT:** Extend and retract the piston rods a few centimeters (inches) before installing the cylinders under the hook. Enerpac recommends that this be done while the cylinders are located in the transport structure. Check all cylinders for leakage.

### 4.4. Making electrical connections

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

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

<table>
<thead>
<tr>
<th>Motor size KW</th>
<th>Electric plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>3Ph + PE 400V 16A</td>
</tr>
<tr>
<td>11</td>
<td>3Ph + PE 400V 32A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor size Hp</th>
<th>Electric plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>3Ph + PE 480V 16A</td>
</tr>
<tr>
<td>15</td>
<td>3Ph + PE 480V 32A</td>
</tr>
</tbody>
</table>

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

**IMPORTANT:** The pumps require correct motor rotation. After connecting the male plug to the electric main power, start the motor and check rotation against the arrow label on the motor and correct phase if required.
5. Preparation for transport

In this chapter, the essential preparations for transporting the SHS System are comprehensively described. Before this preparation can be started, certain information must be known:

These preparations results in:
- A pre operation checklist
- A Before every operation checklist

It is of the utmost importance to read this whole chapter carefully before setting up the machine.

**Failure to prepare correctly for a lifting and transportation operation may result in total loss of machine stability during use.**

5.1. Lifting capacity of the SHS

Check the general description of each cylinder. Refer to paragraph 3.1.
6. Operating the SHS

This chapter contains operation instructions for the SHS system.

6.1. Positioning the cylinders

The cylinder must be placed in with the load as shown in the following picture:

Cylinders must be attached to the hook by using the following pins:

<table>
<thead>
<tr>
<th>Working load limit</th>
<th>diam. bow</th>
<th>diam. pin</th>
<th>diam. eye</th>
<th>width eye</th>
<th>width inside</th>
<th>length inside</th>
<th>width bow</th>
<th>length bolt</th>
<th>length nut</th>
<th>width each</th>
<th>thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>tons</td>
<td>a (mm)</td>
<td>b (mm)</td>
<td>c (mm)</td>
<td>d (mm)</td>
<td>e (mm)</td>
<td>f (mm)</td>
<td>g (mm)</td>
<td>h (mm)</td>
<td>i (mm)</td>
<td>j (mm)</td>
<td>k (mm)</td>
</tr>
<tr>
<td>55</td>
<td>57</td>
<td>57</td>
<td>117</td>
<td>57</td>
<td>83</td>
<td>197</td>
<td>138</td>
<td>341</td>
<td>286</td>
<td>252</td>
<td>26</td>
</tr>
<tr>
<td>85</td>
<td>70</td>
<td>70</td>
<td>143</td>
<td>70</td>
<td>105</td>
<td>260</td>
<td>180</td>
<td>437</td>
<td>344</td>
<td>320</td>
<td>32</td>
</tr>
<tr>
<td>120</td>
<td>83</td>
<td>83</td>
<td>162</td>
<td>83</td>
<td>127</td>
<td>329</td>
<td>190</td>
<td>535</td>
<td>403</td>
<td>356</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Working load limit</th>
<th>diam. bow</th>
<th>diam. pin</th>
<th>diam. eye</th>
<th>width eye</th>
<th>width inside</th>
<th>length inside</th>
<th>width bow</th>
<th>length bolt</th>
<th>length nut</th>
<th>width each</th>
<th>thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>tons</td>
<td>a (inch)</td>
<td>b (inch)</td>
<td>c (inch)</td>
<td>d (inch)</td>
<td>e (inch)</td>
<td>f (inch)</td>
<td>g (inch)</td>
<td>h (inch)</td>
<td>i (inch)</td>
<td>j (inch)</td>
<td>k (inch)</td>
</tr>
<tr>
<td>55</td>
<td>2.00</td>
<td>2.00</td>
<td>4.00</td>
<td>2.00</td>
<td>3.00</td>
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<td>5.00</td>
<td>7.00</td>
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<td>2.00</td>
<td>4.00</td>
<td>7.00</td>
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<td>21.00</td>
<td>15.00</td>
<td>14.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
6.2. Operating the Power pack

Connect the power pack to the electrical main power (Refer to power pack data plate for electrical power requirements. Also refer to Section 4.4 of this manual for additional information).

Push the start button to switch on the motor and pump

Choose the cylinder(s) to move and,
Push down the hand lever to extend the plunger as shown:

Push up the hand lever to retract the plunger as shown:
7. Maintenance and inspection

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

7.1. General

The maintenance requirements are divided into mechanical, hydraulic and electrical inspections. All inspections and associated maintenance procedures should be verified using a checklist.

7.2. Modifications

- Perform the prescribed maintenance tasks at the prescribed times and observe the details regarding the replacement of components.

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

DANGER

Danger
Any Modifications to the SHS could cause a dangerous situation and void the warranty.
7.2.1. Safety during maintenance

The following instructions are general safety rules for maintenance personnel:

1. Familiarize yourself with the system and its operation. Read the Operating Instructions carefully and if necessary have the operator give you proper instructions.
2. Do not perform maintenance work unless you are authorized to do so. Unauthorized personnel must not work on the SHS.
3. Observe all safety and warning signs on the SHS.
4. Observe all safety instructions contained in this manual.
5. Observe the applicable safety regulations when working with inflammable fluids.
6. Perform maintenance work only after the power pack has been switched off. Always ensure that the SHS is protected from unauthorized operation before beginning maintenance work. Switch of the system. Put up warning signs.
7. Be sure the hydraulic system is de-pressurized, before starting maintenance operations at the hydraulic system.
8. In some cases maintenance needs to be performed on motors, and other components during operation (e.g. when making adjustments, etc.). This work must only be carried out by trained personnel. There must always be someone present who can supervise the work on the system and stop it. This is also necessary for work on the electrical system when the system must remain powered up.
9. Do not spill lubricants / oil, etc. Be aware of the environment and the cost of cleaning up.
10. Ensure that all PPE’s and other safety equipment are used when operating conditions demand it.
11. Be aware of fire alarms and firefighting equipment. Know the location and operation of fire extinguishers.
12. Only use appropriate workshop equipment. Prevent damage to parts by the use of unsuitable equipment.
13. No modifications, additions or conversion work must be carried out on the system that could affect the safety of it, without permission of the supplier / owner / operator. This applies also to the fitting and adjustment of safety devices, covers and valves and for welding to supporting parts.
14. Spare parts must conform to the specified technical requirements of the manufacturer.
15. Return the system to proper working order once maintenance work is completed. Inform the operator accordingly.
7.2.2. **Responsibilities**

Maintenance work and inspections must only be performed by trained and qualified personnel. In most cases maintenance can be performed by the operator or in-house service personnel. The operator or trained service personnel can also repair hoses and pipe work. To a certain extent this personnel may also be able to fix failures. For the following maintenance work, however, the manufacturer must be contacted:

- Adjustment of pressure settings in the hydraulic system.
- Adjustment and repairs on hydraulic pumps and the regulation of hydraulic pumps.
- Adjustment and repairs on control valves of all main functions.
- Adjustment of the electrical system and repairs on the control system.
- Welding, cutting, grinding or any other structural adjustment work on the system.
- Replacement of main parts.
- Additional maintenance work not written in this manual

---

**Caution**

It is the customer’s responsibility to maintain and service the system regularly for durability and to keep it in good working order.
7.2.3. Inspection & Maintenance intervals

Maintenance work and inspections must be performed on the system at specific periods (intervals). When the SHS is in operation, the inspection and maintenance intervals are as described in the following list:

- During assembly: Before working with the system you must be sure the system is in good working condition, therefore visual inspection must be performed during assembly.
- During disassembly: During disassembly or out of operation longer than six months, the system must be inspected and maintained thoroughly.
- First 40 hours
- 8 hours or Daily, whichever comes first
- 40 hours or Weekly, whichever comes first
- 100 hours or Monthly, whichever comes first
- 500 hours or Yearly, whichever comes first
- 2.000 hours or 2 Yearly, whichever comes first
- 10.000 hours or 10 yearly, whichever comes first

Note

Unusual operation conditions may result in a more frequent maintenance interval.

The daily, weekly and monthly intervals only apply when the SHS is in operation. If the SHS is out of operation for a period longer than six months, all components requiring lubrication must be lubricated at least once every six months and all uncovered components must be protected against environmental effects.
7.2.4. **General maintenance procedures**

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

1. **Procedures prior to maintenance work.**
   - Safeguard the SHS and equipment against inadvertent movement or operation.
   - Let the power pack cool down. When working on the electrical system or when welding on the construction, shut down the power pack and remove all electric connectors.
   - Clean-up the work area so that access to parts is made easier.
   - Clean the system. Use the appropriate cleaning materials for the items to be cleaned.

2. **Procedures during maintenance**
   - Perform the inspection / maintenance work according to the table and fill in the maintenance form.
   - Use all required PPE’s.
   - Use technical competence and tools suitable for the job.
   - Keep the working area and equipment clean.

3. **Procedures after maintenance**
   - Return the system to proper working order.
   - Check all components for leaks.
   - Fit safety devices and carry out operational checks on the system.
   - Clean up.
   - Inform the owner that maintenance has been performed and have the maintenance form signed.
   - Archive the maintenance form in a logbook.
7.2.5. General maintenance & inspections

The external construction of all mechanical parts must be visually inspected according the intervals listed in the tables. Check for deformation, cracks and rust.

- Safety & warning signs
  
  The safety and warning signs must be checked regularly and if necessary, must be replaced. Replace them as soon as the following criteria are detected:
  
  - If the signs are faded or unreadable, due to oil, grease or moisture.
  - If the signs are damaged or have fallen off

- Lubrication

  Apply a rust inhibitor oil on the cylinder body and all relevant parts.
7.3. Monitor effectiveness of system maintenance

To make sure the system has been maintained according to the manufacturer’s standards each of the following steps should be taken. Perform the prescribed adjustment and maintenance tasks at the prescribed times and observe the details regarding the replacement of components.

7.4. Spare Parts

Only use OEM replacement parts. Modifying or using alternative components may void warranty.

Note
Use only the original equipment manufacturer’s parts.
8. **Mechanical Inspection schedule**

Maintenance and replacement schedules are included in this chapter. Good maintenance will help ensure the uninterrupted and safe use of the machine.

Report any damage and ensure that it is promptly repaired.

8.1. **Mechanical Overview – Time schedule**

In this chapter every maintenance period is described. There are four different periods to check the SHS. 8 hours or Daily, 40 hours or Weekly, First 40 hours, every 100 hours or every month, 500 hours or yearly, 2000 hours or every 2 year and 10,000 hours or every 10 years of use.

The mechanical maintenance is divided in subparts of the total system.

9. **Maintenance & inspections of the hydraulic system**

Only disconnect pipes and hoses that have been depressurized beforehand.

Turn off the power supply and make sure that all control valves have carried out at least one reciprocating motion afterwards. This is to ascertain that the relevant part of the system is depressurized. However, make sure to disconnect hydraulic components at a very slow pace. There is always a risk of splashing oil.

**DANGER**

Danger

Brake valves of pressurized functions (cylinders, motors and accumulators) must never be removed before depressurizing the respective function.

**DANGER**

Danger

Splashing oil can cause physical injuries and fire.

During repairs which involve the disconnecting of hydraulic pipes or hoses, one must be extra careful and prevent dirt from entering the pipes, hoses or other components. Dirt may never enter the hydraulic system. Also look out for paint residues of painted components. These may easily come off during dismantling. The hydraulic system should be kept clean. Immediately cover the connection points with a cap or cover after disconnecting the line or hose. Cover the hydraulic components with paper or linen.
Caution
Dirt can deteriorate hydraulic components and can cause malfunctions or reduced performance.

Caution
Tubing, hoses and fittings may only be replaced by parts with the same quality, bursting strength, length and same connections. Furthermore, the new tubing and hoses must be properly flushed, so no dirt or particles remain in the hoses.

Because of the danger of fire no welding work must be performed on the hydraulic reservoir or oil pipes when they are filled. Tanks must also be emptied first.

9.1. Storage of hoses

- If possible store hoses in a frost-free, cool, dry space with medium air humidity (condensation free).
- Keep the hoses out of direct sunlight (UV radiation) and the outlet flow of ventilators (drying effect).
- Protect the hoses against too much exposure to ozone (released during welding work). Ozone causes accelerated ageing of hoses (splitting due to dryness).
- Protect the hoses against mechanical loading such as dirt (sand and damp) and winding it too tightly (bend radius).
- Store hoses in a horizontal position and ensure that the couplings are supported.
- Use hose brackets instead of support brackets, as support brackets allow the hose to sag, which can cause internal damage to the jacket.
- The hoses must be replaced according the following duty:
  - Heavy duty: 1 to 2 years
  - Medium duty: 4 to 5 years
  - Light duty: 6 to 8 years

9.2. Handling of hoses

1. Keep below the maximum permitted pressure:
• Ensure that peak pressures do not exceed the maximum permitted pressure.
• Ensure that the accumulators and by-pass hoses are in good condition.

2. Do not drive over or stand on the hoses:
• Standing on and driving over the hoses may cause damage to the hose fabric, which could result in leaks.
• A sudden increase in pressure caused by squeezing the hose may cause serious damage to other components.

3. Do not pull on a hose that is connected:
• If pulling forces are exerted on a hydraulic coupling the hose and coupling interface will weaken which may result in the hose bursting out of the coupling.
• Always lift a hose by the hose itself, while supporting the coupling.
• Stow hoses in such a way that no forces (gravitational force) are exerted on the coupling.

4. Do not transport long hoses by holding them in the middle and dragging the couplings over the ground:
• Prevent excessive wear on the couplings and hoses by transporting them on pallets, if possible.
• During assembly the hose must be supported by brackets or hose straps.

5. Do not bend a hose too tightly:
• Do not exceed the prescribed bending radius of the hose.
• Do not bend the hose together such that the flow is (temporarily) stopped, as this will damage the hose fabric and cause a weak spot.
• If necessary use bend guides to prevent twisting of the hose.

6. Protect the hose sleeve in places where chafing etc. cannot be avoided:
• Wear spots can be prevented by sliding protective sleeves over areas where wear is expected or by covering sharp edges.

7. Change worn or damaged hoses immediately:
• If a hose is pressurized continuously by more than 20% above working pressure it must be replaced.
• Do not use dirty or corroded couplings, these are less reliable and will cause leaks over time.

8. Inspect the hoses regularly:
• Inspect the hose for identification, wear, damage and corrosion of couplings.
• Inspect the hose suspension regularly.

9. Inspect the attachment of the couplings:
• Using two thumbs squeeze the hose directly behind the coupling; soft spots indicate a worn hose coupling attachment.
• Inspect the coupling for sealing, wear and corrosion.

10. Clean the hoses on regular basis.
• Cleaning with a soapy solution is often sufficient.
• We do not recommend cleaning with a high-pressure cleaner as sudden changes in temperature will cause local accelerated ageing.
9.3. Check / Change pipes, hoses & screw joints

All pipes, hoses and screw joints must be regularly checked on leakage and visible damages. Damaged parts must be replaced immediately.

Pipes and especially hoses are subject to a natural ageing process, also when they are stored and kept well within tolerable load/pressure conditions. Therefore, their life is limited. Inexpert storage, mechanical damages and un-permissible load or pressures are the most frequent cause of accidents.

Use to the limit of the permissible loads and pressures can shorten the hose life time (e.g. high temperatures, frequent play, extreme high impulse frequencies, use in continuous working).

Hydraulic hoses must be replaced as soon as the following criteria are detected during inspection:

- Damage from the outer layer up to the inner work (e.g. chafing, cuts and cracks)
- Roughening of the outer layer (crack formation of the hose armouring material)
- Deformation, which doesn’t comply with the natural hose form, depressurized as well as under pressure, or at bends, e.g. separating layers, blistering
- Leakage
- Mounting requirements are not met
- Damage or deformation of the hose coupling, which deteriorates the strength of the hose coupling
- The hose is released from the fitting/coupling
- Corroded connection, obstructing the function and firmness of the connection.
9.4. Starting up the system after repair or overhaul

During repair, overhaul or maintenance, air will probably have entered the hydraulic system. The presence of air in the system could seriously damage the system. When starting up make sure that all controls are in neutral position. This also applies to all separate valves. Then make sure that the pumps suction is free of air bubbles. If necessary, de-aerate according to the hydraulic pump manufacturer's instructions. Carefully carry out the machine's motion at a slow pace. Make sure that the machine's set-up is safe.

Below is a step-by-step plan for starting up the system after repair or overhaul:

1. Check oil filter
2. Check oil level
3. Open (cut-off) valves on the tanks.
4. De-aerate all pipes, hoses, pumps, cylinders, valves, etc.

9.5. Hydraulic maintenance schedule

Hydraulic inspection and maintenance intervals are described in chapter 11. There are seven different maintenance and inspection intervals for the SHS: First 40 hours, 8 hours or daily, 40 hours or Weekly, 100 hours or monthly, every 500 hours or yearly, 2000 hours or every 2 years and 10.000 hours or every 10 years of use.

The hydraulic maintenance is divided in subparts of the total system.
10. Electronic inspection schedule

In the event of an electrical fault in the electric control system, you must bring all connected device into a safe condition.

Work on the devices must be performed by a competent, qualified electrician or by trained personnel under the direct supervision of a qualified electrician, in compliance with all applicable rules and regulations.

Switch the power off before inspection, maintenance or repair of SHS. Make sure that the relevant parts are no longer receiving power. If possible, make a connection to earth. Insulate any adjacent components that are still receiving power.

Check and inspect the electrical system of the SHS at regular intervals. Problems, such as loose connections and damaged or stuck wiring, must be resolved immediately. Only use original fuses and circuit breakers with the correct current value.

If work does need to be performed on components receiving power, then a second person must be present in the area to switch off the main power switch in the event of an emergency. Cordon off the work zone and only use certified and properly insulated tools.

Hazard

Electricity is dangerous to people. Only perform maintenance work after the power pack has been shut down. Before beginning maintenance work, always make certain that the power pack is secured against unauthorized use.
## 11. Table of scheduled maintenance

<table>
<thead>
<tr>
<th>No.</th>
<th>Maintenance Item</th>
<th>Qualified person (customer, Enerpac expert)</th>
<th>First 40 hours</th>
<th>8 hours daily</th>
<th>40 hours weekly</th>
<th>100 hours monthly</th>
<th>500 hours annual</th>
<th>2000 ours biannual</th>
<th>10 years</th>
<th>Required Condition or Service Action:</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Hydraulic cylinder</td>
<td>Customer</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No corrosion, leakage or damage</td>
</tr>
<tr>
<td>C1.1</td>
<td>Oil leakage. Visual inspection</td>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1.2</td>
<td>Cleaning with clear water and drying with rags</td>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No leakage</td>
</tr>
<tr>
<td>C1.3</td>
<td>Apply rust inhibitor oil on the cylinder body</td>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>No rust</td>
</tr>
<tr>
<td>C1.4</td>
<td>Extend &amp; retract plunger whole one full stroke</td>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>No leakage</td>
</tr>
<tr>
<td>H1</td>
<td>Hydraulic pump</td>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1.1</td>
<td>Oil leakage. Visual inspection</td>
<td>Customer</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No leakage or damage</td>
</tr>
<tr>
<td>H1.2</td>
<td>Main electric enclosure. Visual check</td>
<td>Customer</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No corrosion or damage</td>
</tr>
<tr>
<td>H1.3</td>
<td>AC Power supply devices (400V, 3Phase). Visual check</td>
<td>Customer</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No corrosions or damage</td>
</tr>
<tr>
<td>H1.4</td>
<td>Main hydraulic hoses &amp; quick couplers. Visual inspection</td>
<td>Customer</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No leakage or damage</td>
</tr>
<tr>
<td>H1.5</td>
<td>Hydraulic couplers &amp; hoses. Replacement</td>
<td>Customer</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No leakage or damage</td>
</tr>
<tr>
<td>H1.6</td>
<td>Directional manual control valve. Seals Replacement</td>
<td>Enerpac expert</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No leakage, smooth movement</td>
</tr>
<tr>
<td>H1.7</td>
<td>Radial piston split flow pump. Inspection</td>
<td>Enerpac expert</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>Check flow delivery. Replace retainer ring and internal seals when pump unprimed</td>
</tr>
<tr>
<td>H1.8</td>
<td>Oil Level &amp; Temperature visual thermometer. Visual inspection</td>
<td>Customer</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No damage, good reading</td>
</tr>
<tr>
<td>H1.9</td>
<td>Oil Return Filter. Filter Replacement</td>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>Oil clean. Indicator in correct range</td>
</tr>
<tr>
<td>H1.10</td>
<td>Clevis eye. Visual inspection</td>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>No damage</td>
</tr>
<tr>
<td>H1.11</td>
<td>Air filter. Filter mesh replacement</td>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>No damage. Filter not clogged</td>
</tr>
<tr>
<td>H1.12</td>
<td>Reservoir. Inside cleaning</td>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>Inside of reservoir clean</td>
</tr>
</tbody>
</table>
### A. Removing cylinders from the structure

Cylinders are delivered in a special modular structure that is also designed for storage.

The structure modules are stackable as shown in the pictures.

Remove the upper frame.

First loosen the bolts that secure the frame to the structure. Then, use the lifting points to lift the frame.

The structure contains two levels.

Remove the cylinders on the upper level first. Then, remove the cylinders on the lower level.

Refer to the following steps.

**ATTENTION** Support the cylinders with a crane to prevent them from dropping when retaining bars are removed. Use only the cylinder lifting eyes to support and lift the cylinders.

Remove the bolts and retaining bars to allow removal of the cylinders on the upper level. Then, remove the cylinders.
<table>
<thead>
<tr>
<th>Diagram 1</th>
<th>Hoses and spare parts are contained inside a storage box. Remove the storage box to allow access to the cylinders on the lower level.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagram 2</td>
<td>Remove the bolts and retaining bars on the lower level. Then, remove the cylinders.</td>
</tr>
<tr>
<td>Diagram 3</td>
<td>Follow the previous steps in the reverse order to store the cylinders after lifting procedures are completed.</td>
</tr>
</tbody>
</table>
B. Hydraulic schematic
C. Assy Drawing
## D. Spare parts

<table>
<thead>
<tr>
<th>SPARE LIST SYNCOIST SHS***</th>
<th>REF. SUPPLIER</th>
<th>Supplier</th>
<th>REF. ORACLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relief valve</td>
<td>MVE4A</td>
<td>Hawe</td>
<td>DB1062663</td>
</tr>
<tr>
<td>Relief valve</td>
<td>MVE4C</td>
<td>Hawe</td>
<td>DB1062663-1</td>
</tr>
<tr>
<td>Manual Directional valve</td>
<td>VHP11-H1</td>
<td>Hawe</td>
<td>DB1154661</td>
</tr>
<tr>
<td>Return filter element</td>
<td>CRE025CD1</td>
<td>Sofima</td>
<td>023-CRE025CD1</td>
</tr>
</tbody>
</table>

### CYLINDER

| Relief valve                | SK7184B       | Hawe     | DB1187663   |
| Check valves                | RK1           | Hawe     | RK1         |
| Overcenter Valve            | LHTEH-30P11-F0-70 | Hawe     | DB1199663   |
| Pressure sensors            | KSEEZB08CMV   | Gefran   | 020-KSEEZB08CMV |
| Stroke sensor cyl.60        | GBF-1530M-U02-1-A0 | MTS     | B140090384  |
| Stroke sensor cyl.40        | GBF-1030M-U02-1-A0 | MTS     | B140090384-2|
| Stroke sensor cyl.20        | GBF-530M-U02-1-A0 | MTS     | B140090384-5|
| Seal KIT SHC 55 TON         | GBF           | MTS      | B140090384-2|
| Seal KIT SHC 85 TON         |               | B&S      | B1400900-52 |
| Seal KIT SHC 110 TON        |               | B&S      | B1400900-72 |
| Male Coupler                | CH604         | Enerpac  | CH604       |
| Female Coupler              | CR400         | Enerpac  | CR400       |
| Sensor cables               |               | Enerpac  | EVO-SC-25   |
E. Hydraulic fluid safety information

SAFETY DATA SHEET
Version 3.0
Effective Date: 20/3/2015

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING
Identification of the product: Hydraulic fluid
Use: For professional use only
Company identification:
ENERPAC B.V.
P.O. Box 8007, 6710 AB EDE
THE NETHERLANDS
Tel: +31 (0)316 555 911

2. HAZARDS IDENTIFICATION
Hazard identification: Keep out of the reach of children.
Symptoms relating to use:
- Skin contact: Not expected to present a significant skin hazard.
- Eye contact: Direct contact with the eyes is likely irritating.
- Ingestion: Swallowing a small quantity of this material presents some health hazard.

3. COMPOSITION/INFORMATION ON INGREDIENTS
Components: This product is not hazardous but contains hazardous components

4. FIRST AID MEASURES
First aid measures:
- Inhalation: If you feel unwell, seek medical advice.
- Skin contact: Wash skin with mild soap and water.
- Eye contact: Rinse immediately with plenty of water.
- Ingestion: Do not induce vomiting. Rinse mouth. Call a physician immediately.

5. FIRE-FIGHTING MEASURES

6. ACCIDENTAL RELEASE MEASURES
Personal precautions: Equip cleanup crew with proper protection.
Environmental precautions: Notify authorities if product enters sewers or public waters.

7. HANDLING AND STORAGE
Storage: Store in tightly closed, properly ventilated containers away from heat, sparks, open flame.
Handling: Wash hands and other exposed areas with mild soap and water before eat, drink or smoke and when leaving work.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION
- Respiratory protection: In case of insufficient ventilation, wear suitable respiratory equipment.
- Hand protection: Wear suitable gloves resistant to chemical penetration.
- Skin protection: Avoid repeated or prolonged skin contact.
- Eye protection: Safety glasses.
- Ingestion: When using, do not eat, drink or smoke.
9. PHYSICAL AND CHEMICAL PROPERTIES
Physical state at 20 °C: Liquid.
Colour: Blue.
Odour: Slight hydrocarbon.
Density: @ 25 °C: 869
Viscosity (cSt at 40 °C): 32
Pour point [°C]: max -35

10. STABILITY AND REACTIVITY
Hazardous reactions: None under normal conditions.

11. TOXICOLOGICAL INFORMATION
Rat oral LD50 [mg/kg]: No data available.

12. ECOLOGICAL INFORMATION
LC50-96 Hour - Fish [mg/l]: No data available.

13. DISPOSAL CONSIDERATIONS
General: Avoid release to the environment. Dispose of this material and its container at
hazardous or special waste collection point. Dispose in a safe manner in accordance with local/
national regulations.

14. TRANSPORT INFORMATION
ADR/RID: No data available.

15. REGULATORY INFORMATION
Symbol(s): None.
R Phrase(s): None.
S Phrase(s): None.

16. OTHER INFORMATION
Further information: None.

DISCLAIMER OF LIABILITY The information in this SDS was obtained from sources which
we believe are reliable. However, the information is provided without any warranty, express
or implied, regarding its correctness. The conditions or methods of handling, storage, use
or disposal of the product are beyond our control and may be beyond our knowledge. For
this and other reasons, we do not assume responsibility and expressly disclaim liability for
loss, damage or expense arising out of or in any way connected with the handling, storage,
use or disposal of the product. This MSDS was prepared and is to be used only for this
product. If the product is used as a component in another product, this MSDS information
may not be applicable.

In case of emergency:
ENERPAC B.V.
P.O. Box 8037, 6710 AB EDE
THE NETHERLANDS
Tel: +31 (0) 318 255 311
F. CE certificate

DEKLARACIA O ZGODSTVU CE
(za v skladu z direktivami 2006/42/EC, prilog II A)

We ENERPAC SPAIN S.L.
P.I. Los Frailes Naves 40 C y D
28814 Daganzo (MADRID), España

Declare under our own responsibility that below mentioned product

SYNCHOIST SYSTEM, models

SHS45520MW SHS48520MW SHS48520MJ SHS45520MJ SHS48520MJ
SHS45540MW SHS48540MW SHS48540MJ SHS48540MJ SHS411060MJ
SHS45560MW SHS48560MW SHS45560MJ SHS48560MJ

On which this declaration refers, is where applicable in accordance with the harmonized European Standards:

- EN-ISO 4413:2010
- EN-ISO 12100:2011
- ASME B30.1-2015
- ASME BTH-1-2014 with the exception of sections 4-11.2a and 4-11.2b
- ENERPAC Quality Standards and Specifications

According the guidelines of the:

- Machinery Directive 2006/42/EEC
- Low Voltage Directive 2006/95/EEC

Daganzo, 22/12/2015

Luis Sordo
ESPA Director EMEA & India