

# Instruction- and Maintenance Manual SUPER LIFT

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Original instructions

*SL100*  
*SL200*  
*SL300*  
*SL400 Narrow*  
*SL400*



## Revisions

Rev	Description	Date	Author	Checked	Approved by
00	First release This document is a merge of the manuals of the SL100, SL200, SL300, SL400-N and the SL400. New developments and insights are integrated: <ul style="list-style-type: none"><li>• Top swivel</li><li>• Free wheel</li><li>• Rotation anchor</li><li>• Sling anchor</li><li>• The purity of the oil</li><li>• Timber width &lt; 50 mm</li><li>• Side load caused by deflection</li><li>• Warning for usage of local control changed</li></ul>	2 Feb 2021	D.Rosier	S.Jansen	R.Broenink
01	Sling guide added	17 March 2021	D.Rosier	Th. Westerhof	R.Broenink

## Preface

Dear customer,

This is the manual for assembling, operating and maintaining the Super Lifts SL100, SL200, SL300, SL400Narrow and the SL400. Differences between the are indicated clearly, if applicable.

Within this manual, the machines are referred to by the term “**System**”.

The manual is part of the handbook of the System and is meant to be used by operators and by maintenance engineers.



**NB:** It is essential that the user reads this manual completely **before** start working with the System.



- All information, illustrations and technical data in this manual are applicable to the System as it was at the **time of issuing** of this manual.
- We continuously **improve** our products and therefore reserve the right to implement improvements and **changes** whenever it is necessary and possible to do so, without any obligation to apply improvements or changes to models purchased previously. Nevertheless, when the system is improved due to serious **safety issues**, you as a customer will be informed.
- If this manual becomes **unreadable**, in whole or in part, you can order a copy by providing us the number given on the front cover.
- Even though the fact that this manual has been drafted with great care, we **cannot guarantee** that it does not contain any errors.
- The use and interpretation of all information in this manual and the possible consequences through improper use of the system are wholly the **responsibility of the user**. Enerpac shall under no circumstances accept any responsibility for such improper use.

Pictures and illustrations in this manual may differ from reality.

Within this document use is made of **structured text**. The following conventions are applied:

- Procedural steps are numbered. Execute the steps sequentially. Do not skip any step.
- Responses of the system are written on the next line in italic font.
- Choices are indicated with bullets.

Example:

1.	Press the green button. <i>The motor starts running.</i>	
2.	Select one of the options: <ul style="list-style-type: none"> <li>• Use the red button to stop the motor</li> <li>• Use the blue button to pause the machine.</li> </ul>	

We are interested in improving our documentation, and we welcome your comments and suggestions. If you have any difficulties using this manual, discover an error, or just want to provide some feedback, contact us. Please include the handbook code as shown at the front page.

We hope this manual will help you to use the System properly.

Enerpac

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# 1 Introduction

## 1.1 Manufacturer address

Enerpac Heavy Lifting Technology B.V.  
Zuidelijke Havenweg 3,  
7554 RR Hengelo (Ov)  
The Netherlands  
Tel. +31 74 242 20 45  
Fax. +31 74 243 03 38  
Email: info.hengelo@enerpac.com  
Website: www.enerpac.com

## 1.2 Declaration

Declaration of Conformity according to Machine Directive 2006/42/EC.  
For the EC Declaration of Conformity reference is made to ref [6] "EC Declaration of conformity" which is part of the product delivery.

## 1.3 Referenced documents



The following documents are referred to in this manual:

Ref	Name	Identification	Manufacturer
1.	Operation of electrical installations - Low voltage	NEN 3140	NEN
2.	Operation of electrical installations	NEN-EN 50110-1	NEN
3.	General rules and safety requirements for systems and their components	NEN-EN-ISO 4413	NEN
4.	Wind calculations	NEN-EN 1991-1-4 Eurocode 1: Belastingen op constructies – Deel 1-4: Algemene belastingen – Windbelasting ( <i>Loads on structures - Part 1-4: General loads - Wind load</i> )	NEN
5.	Technical handbook		Enerpac
6.	EC Declaration of conformity		Enerpac
7.	ASME B30.1-2015	Jacks, Industrial Rollers, Air Casters, and Hydraulic Gantries. (Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings)	American Society of Mechanical Engineers



## 1.4 Identification

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

<b>ENERPAC</b>  	
Type	<input type="text"/>
Drawing	<input type="text"/> Rev. <input type="text"/>
Order nr.	<input type="text"/>
Machinery part	<input type="text"/> of <input type="text"/>
Description	<input type="text"/>
Year of manufacture	<input type="text"/>
Self weight	<input type="text"/>
<p><b>Enerpac Heavy Lifting Technology B.V.</b>          Zuidelijke Havenweg 3 7554RR Hengelo - The Netherlands          Tel. +31(0)74 24 22 045 Service tel. +31(0)74 85 04 777</p>	



**NB:** Name plates are official documents. It is not permitted to alter them or render them illegible.

## 1.5 Liability

- Personnel as well as other people involved in the usage of the System are expected to have read and understood this manual.
- In cases of doubt about the use or application of this machine, always contact Enerpac for advice and recommendations.
- Unauthorised alterations to the machine may have a deleterious effect on the characteristics of the machine and may disrupt the control functions. Unauthorised alterations therefore annul any resultant damage claims against Enerpac.
- The risk analysis conducted by Enerpac, intended usage and reasonably foreseeable incorrect usage of the System were assessed. The instructions in this manual were drawn up based on this analysis.

## 1.6 Intended use

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. Enerpac 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.

- The System should only be used in the **intended manner** as described in the instructions in this manual.
- The System should only be operated by **operators** with full knowledge of the applicable safety regulations and the hazards which may arise during use.
- The System was developed and built according to the 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 System may not function properly or may create **hazardous** situations.
- The System should only be used if the machine is in perfect technical **condition**.
- Faults which may result in hazardous situations must be **resolved** immediately.
- The machine must not be used in potentially **explosive** environments.

The System is intended to move a heavy load in three directions:

- In vertical direction.
- In longitudinal direction.
- In transversal direction (optional).

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## 1.7 Modifications

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

**Spare parts** should meet the technical specifications given by Enerpac. Apply **original spare parts** as these parts are made according to the technical specifications of Enerpac. In cases of doubt, please contact Enerpac.

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## 1.8 Personnel and responsibilities

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- Only qualified personnel are allowed to operate the System. Qualified personnel are those who have certified skills to operate the System. They should preferably have received training from Enerpac, or else from the customer.
- Only qualified personnel are allowed to maintain the System. Qualified personnel are those who have certified main education for the jobs they have to perform, either mechanical, hydraulically or electrical. They should preferably have received training from Enerpac, or else from the customer.
- Qualification of the personnel is a responsibility of the customer.
- Always comply with legal minimum age stipulations.
- The System should 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. 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 System under continuous supervision of a qualified person.
- Work on the electrical and the hydraulic systems must be performed by competent, qualified personnel, or by trained personnel under the direct supervision of qualified personnel, 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 System.

The responsibilities listed in the following sub-sections are in accordance with the standard as referred to in Ref [7] ASME B30.1-2015.

In some situations, the owner and the user may be the same entity and is therefore accountable for all of the following responsibilities listed in this chapter.

In other cases, the user may lease or rent the system without supervisory, operational, maintenance, support personnel, or services from the system owner. In these situations, sections 1.8.1 “The owner of the system” and 1.8.2 “The user of the system” shall apply.

---

### 1.8.1 The owner of the system

---

The responsibilities of the owner of the system are:

- a) to make sure the system meets the requirements as given in this manual as well as specific job requirements defined by the user,
- b) to make sure the system and all necessary components, specified by the manufacturer, meet the user's requested configuration and capacity,
- c) to provide the applicable capacity charts to the user,
- d) to provide this manual to the user to enable correct assembly, disassembly, operation and maintenance information,
- e) to make sure all inspections and maintenance activities are performed,
- f) to designate personnel for maintenance, repair, transport, assembly, and disassembly,

- g) and to designate personnel for inspections as required in the applicable chapters.

---

## 1.8.2 The user of the system

---

The responsibilities of the user of the system are:

- a) to comply with the requirements of this manual and all regulations applicable at the work site,
- b) to use supervisors for activities,
- c) to ensure that the system is in proper operating condition, prior to initial use at the worksite by
  - verifying that the Owner has provided this manual,
  - and verifying that a frequent inspection has been performed,
- d) to verify that the system has the necessary capacity to perform the proposed operations in the planned configuration,
- e) to ensure the assigned operators have been notified of adjustments or repairs that have not yet been completed, prior to commencing operations,
- f) to designate personnel for inspections as required in the applicable chapter,
- g) to designate personnel for maintenance, repair, transport, assembly, and disassembly,
- h) to ensure that all personnel involved in maintenance, repair, transport, assembly, disassembly, and inspection are aware of their responsibilities, assigned duties, and the associated hazards,
- i) and to ensure that the inspection, testing, and maintenance programs specified by owner are followed.

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## 1.8.3 The site supervisor

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In some cases, the site supervisor and the system director may be the same person.

The responsibilities of the site supervisor shall include the following:

1. ensuring that the system meets the requirements prior to initial site usage.
2. determining if additional regulations or requirements are applicable.
3. ensuring that a qualified person is designated as the system director.
4. ensuring that the operations are coordinated with other jobsite activities that will be affected by or will affect the operations.
5. ensuring that the area for the system is adequately prepared. The preparation includes, but is not limited to, the following:
  - a. access for the system and associated equipment.
  - b. sufficient room to assemble and disassemble the system.
  - c. an operating area that is suitable for the system with respect to levelness, surface conditions, support capability, proximity to power lines, excavations, slopes, underground utilities, subsurface construction, and obstructions to operation.
  - d. traffic control as necessary to restrict unauthorized access to the system's working area.
  - e. ensuring that work involving the assembly and disassembly of system is supervised by a qualified person.
  - f. ensuring that operators meet the physical, knowledge, and skill requirements as described in this manual.
  - g. ensuring that conditions that may adversely affect the operations are addressed. Such conditions include, but are not limited to, the following:
    - poor soil or support conditions
    - wind velocity or gusting wind
    - weather conditions
    - extreme temperatures
    - inadequate lighting
    - operating surface conditions
    - excessive noise proximity to energized sources (e.g., power lines, pressurized lines)
    - ensuring that work performed by the rigging crew is supervised by a qualified person
    - ensuring that maintenance is performed by a designated person

---

## 1.8.4 The system director

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The system Director's responsibilities shall include the following:

- a. being present at the job site during the operations.
- b. stopping the operations if alerted to an unsafe condition.

- c. ensuring that the preparation of the area needed to support the operation has been completed before the operation starts.
- d. ensuring necessary traffic controls are in place to restrict unauthorized access to the system's work area.
- e. ensuring that personnel involved in the operations understand their responsibilities, assigned duties, and the associated hazards.
- f. addressing safety concerns raised by the system operator or other personnel and being responsible if he decides to overrule those concerns and directs the operation to continue. In all cases the manufacturer's criteria for safe operation and the requirements of this manual shall be followed.
- g. designating the signal person(s) and conveying that information to the system operator.
- h. evaluating the operation in proximity to energized sources.
- i. ensuring precautions are implemented when hazards associated with special load handling operations are present. Such operations may include, but are not limited to, the following:
  - multiple types of system used simultaneously
  - shifting centre(s) of gravity or lifting below the centre of gravity
  - shifting, inclined, or moving surfaces
  - operating barges
  - informing the system operator of the weight and planned movement of the loads to be handled.
  - obtaining the system operator's verification that this weight does not exceed the system's rated load.
  - ensuring that load rigging personnel have been designated for the system.
  - ensuring that the load is properly rigged and stable.

### **1.8.5 The operators**

The system Operator shall be responsible for the following listed items.

The system Operator shall not be responsible for hazards or conditions that are not under his direct control and that adversely affect the system operations.

Whenever the system Operator has doubt as to the safety of operation, the system Operator shall stop the system functions in a controlled manner. System operations shall resume only after safety concerns have been addressed and the continuation of the operation is directed by the system Director.

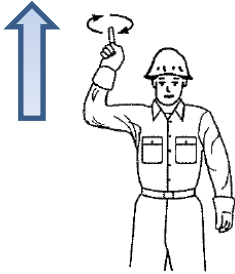
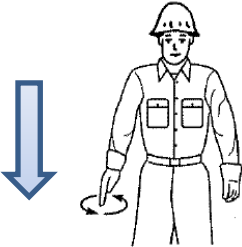
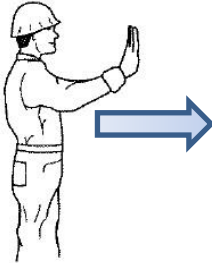
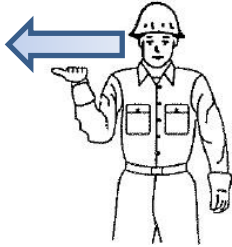
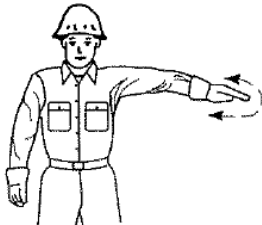

The system Operator's responsibilities shall include the following:


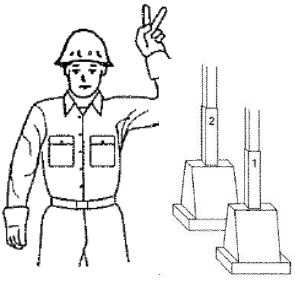
- a. reviewing the requirements for the system with the Director before the operations.
- b. knowing what types of site conditions could adversely affect the operation of the system and consulting with the system Director concerning the possible presence of those conditions.
- c. understanding and applying the information contained in this manual.
- d. understanding the system's functions and limitations as well as its particular operating characteristics.
- e. using the system's load/capacity chart(s) and diagrams and applying all notes and warnings related to the charts to confirm the correct system configuration to suit the load, site, and load handling conditions.
- f. refusing to operate the system when any portion of the load or the system could be adversely affected by proximity to energized sources until evaluated and approved by a qualified person.
- g. performing inspections as specified in the applicable chapter.
- h. promptly reporting the need for any adjustments or repairs.
- i. following applicable lock out/tag out procedures,
- j. not operating the system when physically or mentally unfit.
- k. ensuring that all controls are in the off or neutral position and that all personnel are in the clear before energizing the system.
- l. not engaging in any practice that will divert his attention while actually operating the system controls.
- m. testing the system function controls that will be used and operating the system only if those function controls respond properly.
- n. operating the system's functions, under normal operating conditions, in a smooth and controlled manner.
- o. knowing and following the procedures specified by the system manufacturer or approved by a qualified person for assembly, disassembly, and setting up the system.
- p. knowing how to travel the system, if applicable.
- q. ensuring that the load and rigging weight(s) have been provided.

- r. calculating or determining the rated load for all configurations that will be used and verifying, using the capacity chart(s), that the system has sufficient capacity for the proposed operation.
- s. considering all factors known that might affect the system capacity and informing the system Director of the need to make appropriate adjustments.
- t. knowing the standard and special signals as specified in the applicable chapter and responding to such signals from the signalperson. When a signalperson is not required, the system Operator is then responsible for the movement of the system. However, the system Operator shall obey a stop signal at all times, no matter who gives it.
- u. Understanding of rigging and basic rigging procedures. Ensuring that the load is properly secured and will be lifted safely.
- v. if power fails during the operations
  - set all locking devices
  - move all power controls to the OFF or neutral position
  - secure and stabilize the load, if practical
- w. before leaving the system unattended
  - secure and stabilize the load
  - set all locking devices
  - put the system controls in the OFF or neutral position
  - turn off the system power source
  - follow the recommendations as given in this manual or given by a qualified person for securing the system

## 1.9 Hand signals

The following hand signals are applicable when using the system:

<p><b>RAISE.</b></p> <p>With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p>		<p><b>LOWER.</b></p> <p>With arm extended downward, forefinger pointing down, move hand in small horizontal circle.</p>	
<p><b>GANTRY TRAVEL.</b></p> <p>Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.</p>		<p><b>SIDE SHIFT.</b></p> <p>Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.</p>	
<p><b>STOP.</b></p> <p>Arm extended, palm down, move arm back and forth horizontally.</p>		<p><b>EMERGENCY STOP.</b></p> <p>Both arms extended, palms down, move arms back and forth horizontally.</p>	

<p>END EVERYTHING.</p> <p>Clasp hands in front of body.</p>		<p>INDIVIDUAL LEGS.</p> <p>Hold up: one finger for leg marked: "1," two fingers for leg marked "2".</p> <p>Regular signals follow.</p>	
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## 1.10 Lifetime

No lifetime of the System is specified, since its safe and effective lifetime strongly depends on

- the intensity of use,
- the quality of the maintenance,
- the service conditions the system is exposed to, like wet or salty environments,
- and the load to which the system is exposed.

## 1.11 Warning symbols used within this document

In this manual warnings and symbols are used to draw your attention to important safety information. The table below shows the applied warnings and symbols:



**NB** is used to highlight important **work activities** and for **additional information**



**Caution** is used if failure to heed the given instructions may result in **damage to the system**.



**Attention** is a general warning to the operator of potential damage to **equipment** and the **environment**.



**Hazard** draws the user's attention to potential **hazards to personnel** if work instructions are not followed precisely.

## 2 General safety aspects

This chapter contains general safety aspects.  
Specific safety directions are mentioned in other chapters.

### 2.1 Mandatory protective gear

While using the System ensure that the locally applicable safety regulations are observed

Make sure that all people on the working place observe the following safety regulations:



Always wear safety goggles and a safety helmet



Always wear safety footwear



Wear safety gloves. But we strongly advise not to wear them when operating handheld control consoles



Wear a safety harness when working at heights more than 2 meters

### 2.2 General safety regulations

Special safety regulations are given in the relevant national legislations or company regulations for 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:

- Keep the worksite **clean**.
- Before every start-up, always check that there are no **persons** in an unsafe situation or position with respect to the System. Stop working if, despite warnings, there are still employees in an unsafe situation.
- Only use the System on an adequately stable and robust **subsurface**.
- Keep all equipment out of the area of above-ground **power lines**.
- The **coverings** must be closed (this does not apply to the covering on control panels).
- The operator must switch off the System before leaving it **unattended**.
- Use all required **Personal Protection Equipment (PPE)**.
- Do not wear any loose **clothing or jewellery**. Long hair must be tied back.
- **Tools** and equipment, necessary for (dis-)assembly of the System as well as for maintenance have to be in good condition. Badly maintained equipment can cause time wastage and lead to permanent damage to the equipment and/or its surroundings
- Keep the hydraulic and moving equipment of the System **clean** to prevent it from jamming or causing damage to itself or other equipment.
- Do not use the System, whether loaded or not, while unauthorized people are in its **vicinity**. The System can be operated remotely.
- Maintain **focus** during the work. Carelessness may result in serious injuries.
- Additional **lifting gear** and accessories such as hawsers, shackles, lugs, slings etc. must comply with the legal requirements imposed in the country of use.
- **Inspect** the condition of the System before *every* individual start-up, given the fact that the slightest defect may have severe consequences.
- Personnel shall not place any **part of their body** under the load.
- Personnel shall **remain clear** of the system during operation.
- Personnel shall **not ride** on the system while it is moving or being moved.
- Remove loose tools or components from the load or the System if the load will be moved as they might fall down during moving, which can lead to fatal accidents.

Enerpac is not liable for improper use of accessories in combination with the System.

## 2.3 Symbols applied to the System

The System can be labelled with

- warning symbols,
- mandatory signs.

The table below shows the most commonly used **warning symbols** in industrial environments:



**Danger** of contact with moving machine parts



**Danger** of lethal voltage in the control panels



Danger of **parts of hands** getting trapped/caught



Danger of **parts of feet** getting trapped/caught



Danger of **falling**



**Danger** Exercise extreme attention and caution when **under moving loads**.



Danger of getting **trapped**/caught between moving parts.

The table below shows the most common symbols of **mandatory signs** in industrial environments:



**Read** the instruction manual.



Wear **gloves** to prevent injury from and/or exposure to chemicals.



Wear safety **glasses** to prevent eye injuries.



Wear safety **shoes** to prevent injuries caused by falling objects and/or feet getting caught in machinery.



Wear **hearing** protection.



Wear a safety **helmet** to prevent injuries caused by falling objects.



Wear a safety **harness**



Hoisting point



Strapping point for transport



**NB:**

- The stickers on the machine are official documents and it is not permitted to alter them or render them illegible
- It is strictly obligatory to observe the warning symbols and the mandatory signs applied to the machine.

## 2.4 Welding work

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- Welding, cutting and grinding work on the System is only permitted with the **prior written consent** of Enerpac.
- Welders must be properly qualified and must have a valid welding certificate.
- If welding work needs to be performed on the System, then
- Switch the machine off
- Disconnect all power cables and communications cables
- Connect the system to a direct earth line.



**NB:** welding, cutting, grinding or any other structural adjustment work on the System is not permitted without Enerpac's prior written permission

## 2.5 Working on the electrical system

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- In the event of an electrical fault in the electric control system, you must bring all connected devices into a safe condition. **Switch off** the System.
- 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 such as
  - Ref 1 "Operation of electrical installations - Low voltage"
  - Ref 2 "Operation of electrical installations".
- **Switch the power off** before inspection, maintenance or repair of the System. Make sure that there is no power on the relevant parts. If necessary, connect the machine to earth. Insulate any adjacent component that is still under voltage.
- Check and inspect the electrical system of the System 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 which are under **voltage**, then cordon off the work zone and only use certified and properly insulated tools.

## 2.6 Working on the hydraulic system

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- Work on the hydraulics system or other components in 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.
- Check all pipes, hoses, quick-release couplings and screw joints **regularly** for leaks and visible external damage. Repair damage immediately. Pressurized hydraulic fluid leaks may cause serious injury, and it may cause 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.
- Expand and install pressurized hydraulic pipes, tubes and lines in accordance with professional standards.
- Make sure that no ports have been **switched** during re-installation work.
- All parts and the length and quality of hoses meet the requirements of Ref 3 "General rules and safety requirements for systems and their components".

## 2.7 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 sure you are up-to-date on these rules.

In any case, the following actions are necessary in the event of a fire:

- Keep **calm**.
- **Report** the emergency to the employee responsible for in-house emergency services (IHES). Tell who you are, where you are located and describe the emergency situation. (The IHES employee will notify external emergency services.)
- **Warn** your colleagues.
- **Extinguish** the fire if it is still in its early stage, using the extinguishing means available onsite.
- If possible, **switch off** the electrical power supply.
- Leave **the scene** of the emergency situation and report to the rendezvous point.



**Caution:** Never use water to put out an electrical fire or a fluid fire

## 2.8 Working with hazardous substances

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It is thought that special first aid procedures are required in cases of accidents with chemicals. But in cases of small quantities, standard measures suffice:

1. rinse thoroughly with water
2. wash with soap
3. provide fresh air
4. remove any contaminated clothing

In common the following rules are applicable:

- Contact with **skin**:
  - rinse thoroughly with water
  - remove any contaminated clothing
  - wash the relevant body parts with soap.
- Contact with **eyes**:
  - rinse thoroughly with water (10 till 15 minutes) using eye wash fountain
  - 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 oesophagus again.
  - If the victim is unconscious, 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 (TREM CARD book, safety information sheets and the catalogue) and report everything that is relevant to the accident to a doctor.

When work has to be done in confined spaces:

- Wear personal protection equipment
- ventilate according to the relevant regulations
- Ask a colleague to remain by the entrance in order to provide assistance in the event of an emergency.
- You are legally required to be **familiar with the potential hazards** of the product. The safety information sheets are intended to provide adequate, correct and up-to-date information on all substances used on the worksite.
- Relevant safety information sheets are given in 14. □ F "Hydraulic fluid safety information".

During maintenance, you may work with substances fitted with **GHS symbols**. These GHS symbols are explained in the next below.<sup>1</sup>

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

## 2.9 Assembly and disassembly

- **Assembly** and disassembly of the System has to be performed by properly trained operators
- Only use **certified lifting** and hoisting equipment.  
Check the validity of these certificates and qualifications.
- Only use lifting and hoisting equipment with **suitable capacity** for the loads in question.
- Before commissioning, any parts that were disassembled for transport must be **re-assembled**, re-installed, checked and approved by qualified personnel.
- Make sure that the **instructions in this manual** have been followed precisely before commissioning the System.
- **Lift** loads as described in the user manual (connection points for lifting hooks) and observe the professional standards.



**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 and seriously injure you

<sup>1</sup> 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 Harmonised System for classification and labelling of chemical 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).

## 2.10 Transport, loading and unloading of the System

- Loading and unloading has to be performed by properly trained operators
- Only use lifting and hoisting equipment with suitable capacity for the loads in question.
- 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 all electrical and hydraulic connections when the System has to be moved, even if it is for only a short distance.
- To avoid damage during transport use timbers, rubber pads and plastic for packaging.
- Containers may be used for transport, since they provide rigid protection against and avoid weather influences. Make sure that all parts are secured against sliding around.

## 2.11 Dealing with hoses




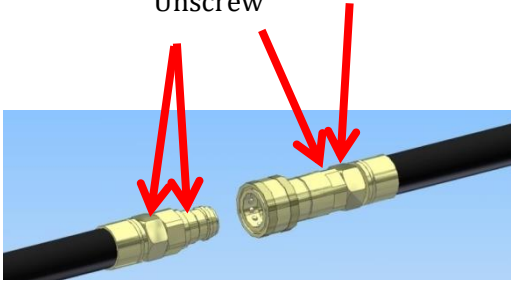
**NB:** The instructions in this section are given for reasons of completeness, since the system is not equipped with hydraulic hoses to be handled.

### 2.11.1 Common directions

- Make sure the **maximum** permitted pressure is never exceeded:
  - Do not change any safety setting.
- Ensure that the **accumulators** and by-pass hoses are in good condition.
- Do not **drive over** or stand on the hoses:
  - Standing on and driving over the hoses causes' damage to the hose fabric, which causes leaks.
  - A sudden increase in pressure caused by squeezing the hose causes serious damage to other components.
- 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, whilst supporting the coupling.
  - Stow hoses in such a way that no forces (gravitational force) are exerted on the coupling.
- While moving the hoses, prevent the couplings **being dragged** 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 necessary use bend guides to prevent twisting of the hose.
- 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.
- 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.
  - They are less reliable
  - They will cause leaks over time.
  - They pollute the hydraulic system
- **Disconnecting** hydraulic tubing and hoses shall be done with utmost care.
  - The system is designed in such a way that hydraulic pressure drops to zero when the system is switched off. Nevertheless, pressure can remain due to
    - The presence of load on the system
    - Raise of temperature
  - But the hydraulic connections have been designed in such a way that either

- they cannot be uncoupled when they're under pressure, or
- they can be uncoupled under pressure of only a few bars, but measures have been taken that no oil can come out
- Always use the manometers of the System to verify that the pressure is zero.

## 2.11.2 Main procedure for connecting hoses

1.	Inspect the couplings. Clean the coupling if dirty. Replace the coupling if damaged.	
2.	Clean the inner and outer side of the couplings before they are mounted; dirt might get in the system causing damage. Use degreaser.	
3.	Dry the couplings with paper and visually check them for dirt.	
	 <b>Caution:</b> Do not use any brake cleaner or other detergents; they might affect the couplings.	
4.	Hoses which are not mounted may be under pressure though, due to exposure to warmth. If so, it is hard to connect the couplings. To reduce the pressure in the hose: 1. Twist the coupling off the hose. <i>A little until oil will come out</i> 2. Turn the coupling tight again.	<p>Unscrew</p> 
5.	Screw the screw-coupling together to the end. <i>While tightening the couplings, the oil passage is opened up</i>	



**Hazard:** Careless handling of hydraulics can cause serious injuries

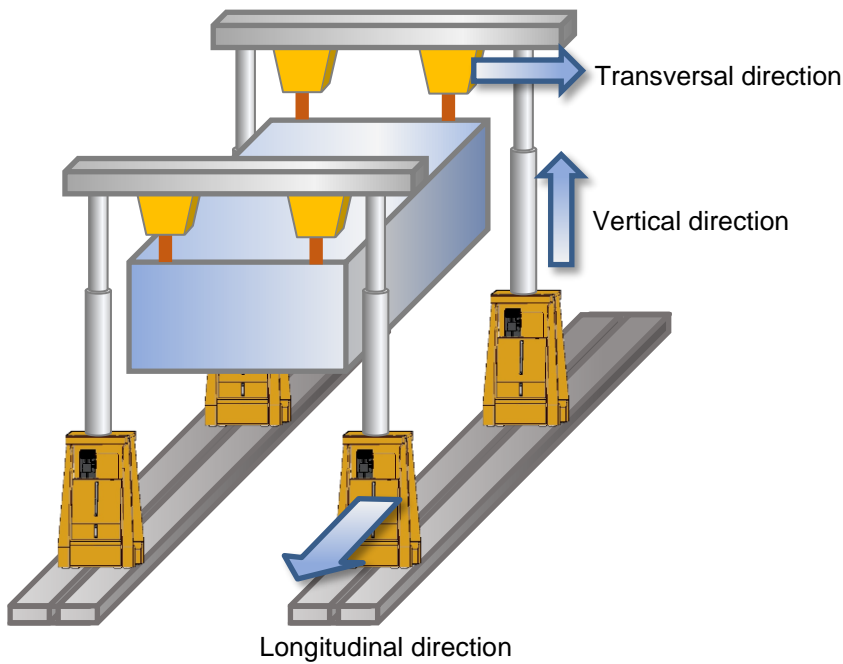
## 3 System Overview

This chapter describes the main functions and components of the System.

### 3.1 General

The System is intended to move a heavy load:

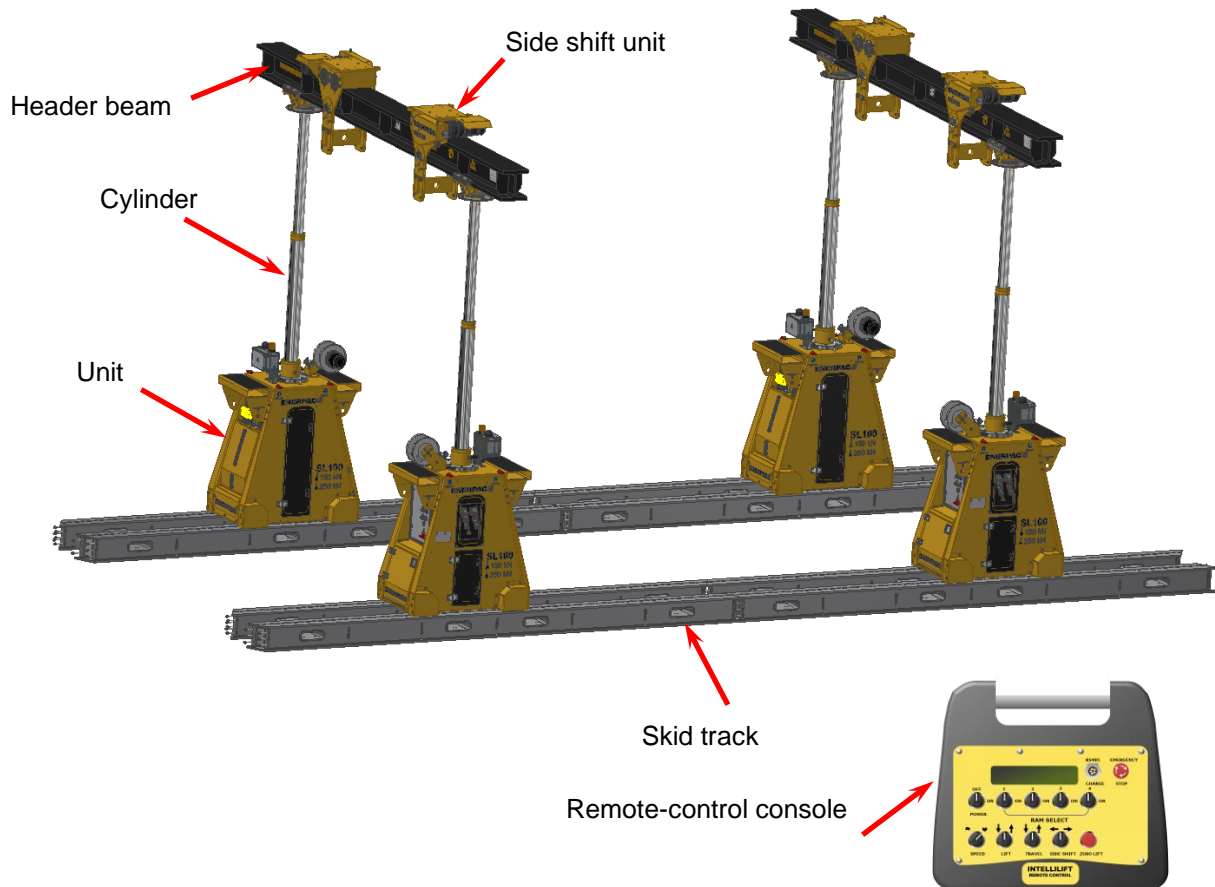
- In vertical direction by extending the lifting cylinders.
- In longitudinal direction by travelling along tracks.
- In transversal direction by moving the side shift units along the header beams. This is optional.



## 3.2 Main parts



**NB:** Pictures and colours may differ for the different systems.



The system is a four-point lifting system which can move a heavy load in three directions:

- Vertical direction, by extending the four cylinders.  
The cylinders move computer controlled and synchronized.
- Longitudinal direction, by moving the units along the skid track. The units are provided with wheels.  
The units move computer controlled and synchronized.
- In transversal direction, by moving the **side shift units** along the **header beams**. Side shift units are provided with electric motors. They are optional; the load can also be suspended by **lifting lugs**.

Each unit has its own on-board hydraulic power; no hydraulic hoses are used on the working scene. Only electricity has to be connected to each unit.

The system is controlled remotely by a handheld **remote-control console**. This enables operating the system on a safe distance.

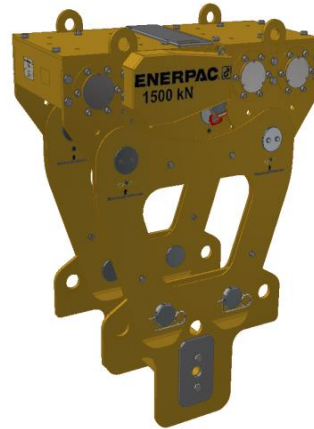
Different types of side shift units are available:



SSU300



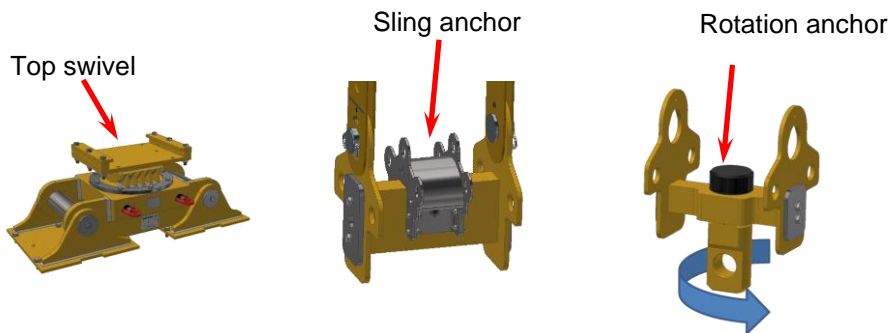
SSU150



SSU600

Optionally, the side shift units can be provided with

- A top swivel. This enables mounting header beams on top of the side shift units.
- A rotation anchor. This enables rotating the load by manpower while the load is lifted.
- Sling anchors. This enables the use of slings for lifting.

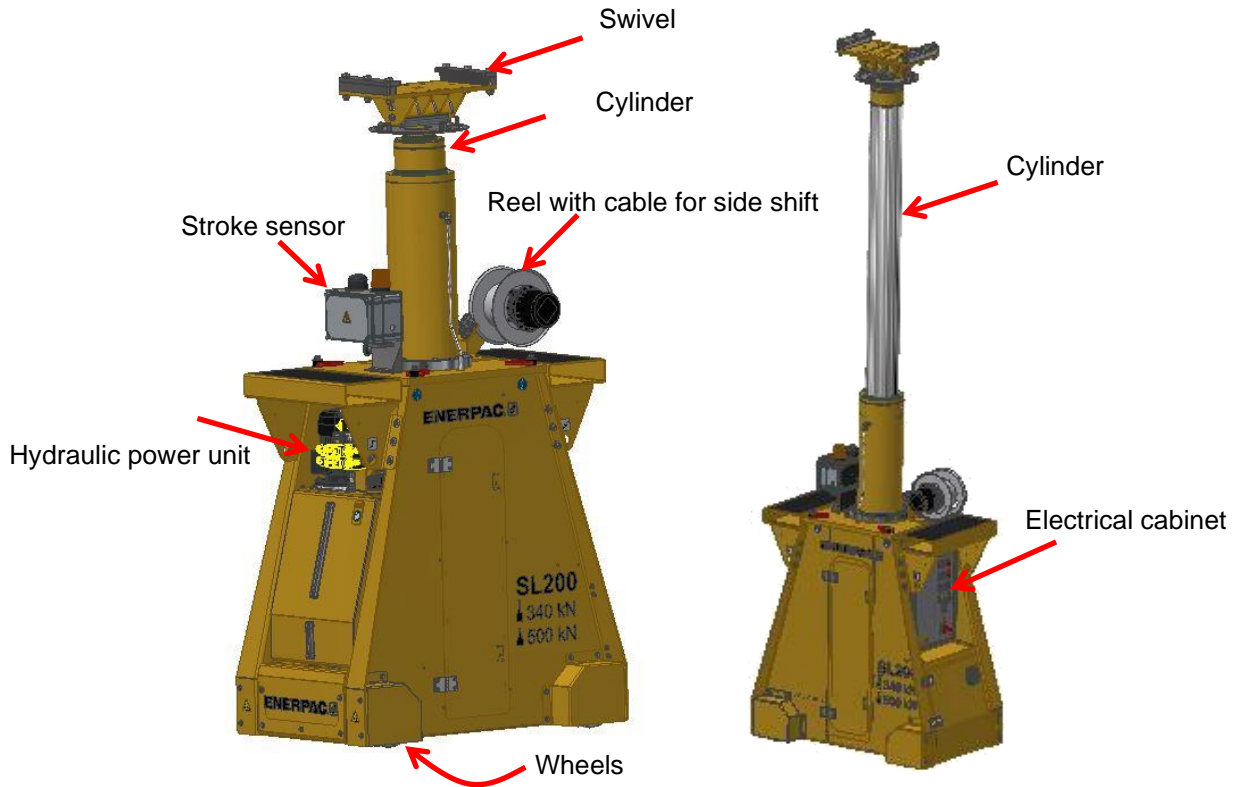


The load can be suspended by **lifting lugs** as well.

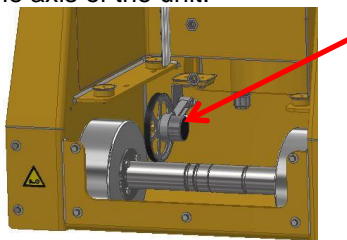




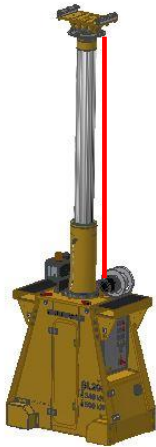
**3.2.1 The unit**



- The cylinder consists of a telescopic cylinder system, extending in two (SL100, SL200, SL300) or three (SL400, SL400N) stages. The upper stages are either provided with oil by internal piping (SL100, SL200, SL400N, SL400), or by hoses, running on the hose reel (SL300).
- The units have to be provided with electrical power
- Each unit is provided with a hydraulic power unit (HPU), consisting of an electromotor and a hydraulic pump. The pump powers the lifting cylinder and wheel drives.
- Each unit is provided with a sensor which measures the travelling distance. The sensor is located at the axis of the unit.



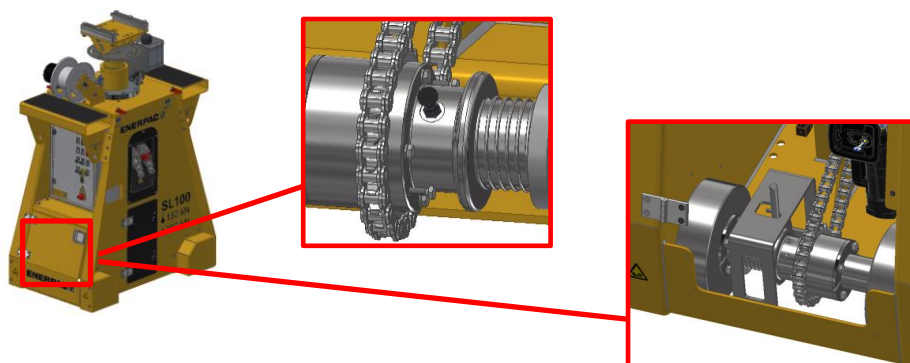
- In order to synchronise the lifting heights of all units, each unit is provided with a stroke sensor, which is connected by a line to the top of the cylinder.



- The side shift, if applied, is provided with power by a power cable on the cable reel. The cable reel is optional.
- The electrical cabinet contains all electronics of the unit.
- On the front side of the electrical cabinet a control panel is located. Using the buttons and controls of the control panel, the unit can be controlled locally. This is intended for maintenance and set up purposes. Other units cannot be controlled by the control panel.



- Using the remote-control unit, all units can be controlled individually or simultaneously on a safe distance. Remote control can be done wireless or by wire.
- The driving system of the unit can be uncoupled from the wheels, to enable pushing the unit along the skid tracks by manpower. Such is useful during installation. Uncoupling is done by shifting the hub as shown below.
- All but the SL400 are provided with the Freewheel mechanism, which enables rolling the unit by manpower over the skid tracks. Two slightly different types can be applied. One is controlled with a boltm the other with an handle.



### 3.2.2 Header beams

The Header beams across the top of the Units create a portal. They can consist of more sections.



Header beams of various lengths and capacities can be applied; reference is made to Appendix Z. The header beams have to be applied in accordance with the capacity charts of the specific header beam.

Header beams of different brand may be applied if

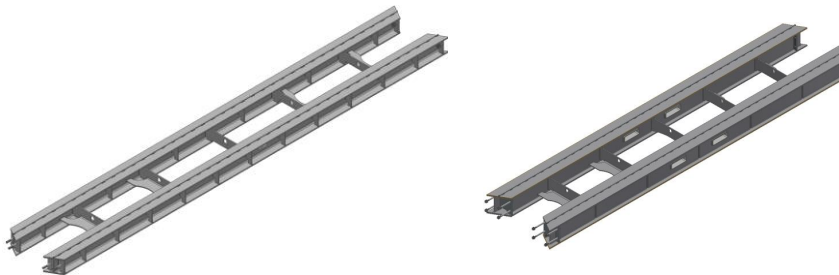
- the material properties are the same,
- made from similar web, and
- flange dimensions match with the Enerpac beams



**Attention:** Header beams of different brand can be applied if their capacity is sufficient, but Enerpac will not take any responsibility for it.

### 3.2.3 The skid tracks

The Skid tracks form a railway on which the system travels. Skid tracks are provided with a longitudinal ridge to guide the units while travelling.



**Attention:** Skid tracks of different brand can be applied if their capacity is sufficient, but Enerpac will not take any responsibility for it.

### 3.2.4 Side shift units

The load can be affixed to the header beam by means of side shift units. The side shift units enables the load to be moved in transverse direction. Each side shift is provided with an electrical drive which propels rollers. The rollers run on the header beams. The drive has a single speed.

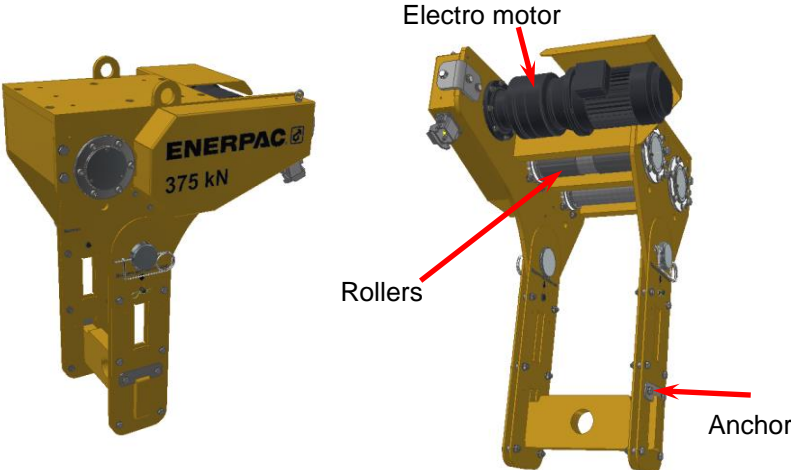


The side shift units can be controlled

- by the remote-control device
- by the control panel on the electrical cabinet.; this is intended for maintenance and setup purposes.

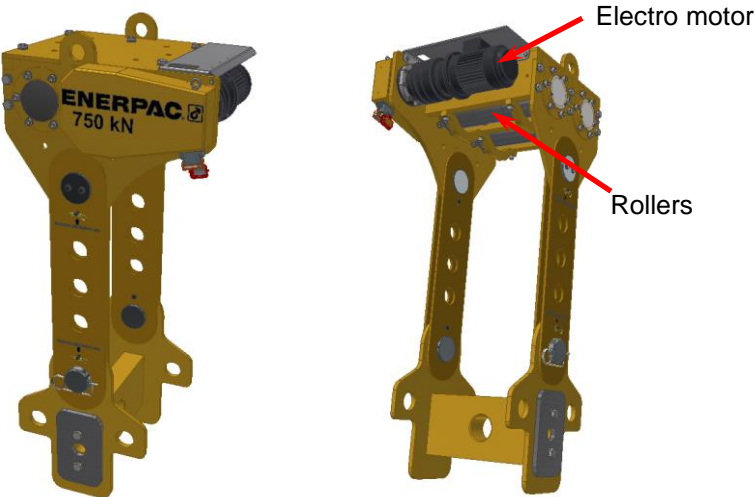
The next section shows the types of side shift units which can be applied. Their principles are equal; just the construction and the lifting capacities differ.

**3.2.4.1 Type SSU150**

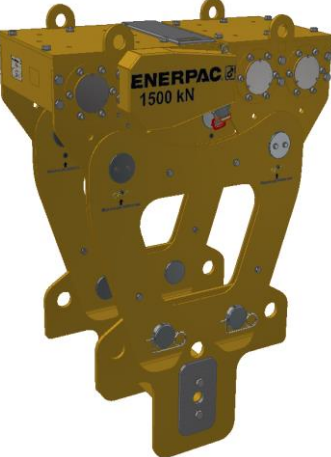


The SSU150 side shift unit is provided with an electro motor and rollers.

**3.2.4.2 Type SSU300**



**3.2.4.3 Type SSU600**



## 3.2.5 Lifting lugs

If there is no need to move the load in transverse direction, you can make use of simple lifting lugs to affix the load to the header beam.



**Attention:** Lifting lugs of different brand can be applied if their capacity is sufficient, but Enerpac will not take any responsibility for it.

## 3.2.6 The remote-control console

The remote-control console enables the operator to control the system on a safe distance. The device is able to control

- one single unit
- all units in a synchronised way

The remote-control console can be connected to the system

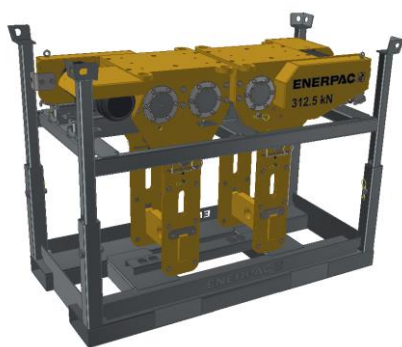
- by radio
- by wire



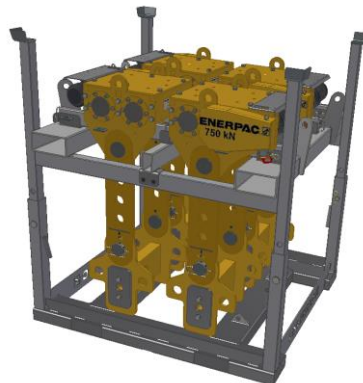
## 3.2.7 Options for side shift units

### 3.2.7.1 Transporting frames

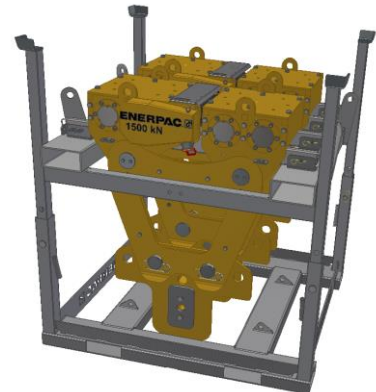
Frames for transport and storage are available for all types of side shift units.



SSU150



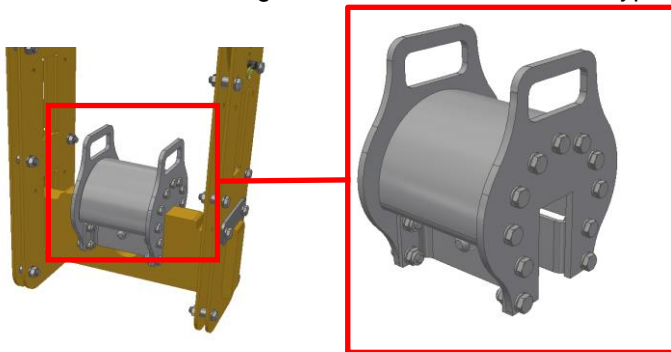
SSU300



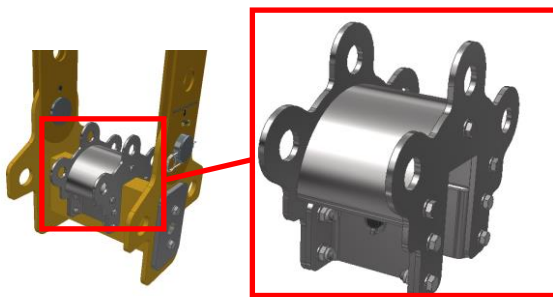
SSU600

### 3.2.7.2 Sling anchors

Sling anchors enable usage of slings for lifting. The sling anchors are positioned over the anchor plate of the side shift unit. Sling anchors are available for all types of side shift units.



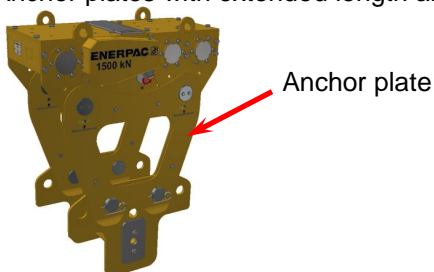
SSU300, SSU300



SSU600

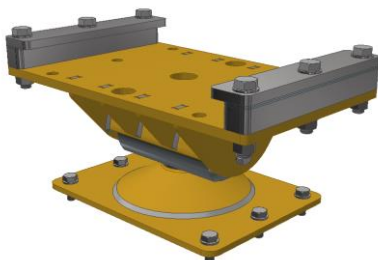
### 3.2.7.3 Extended anchor plates

Anchor plates with extended length are available for all types of side shift units.

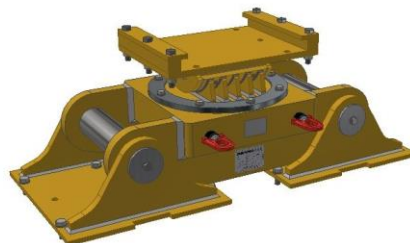


### 3.2.7.4 Top swivels

Top swivels are available for all types of side shift units.



SSU150, SSU300



SSU600

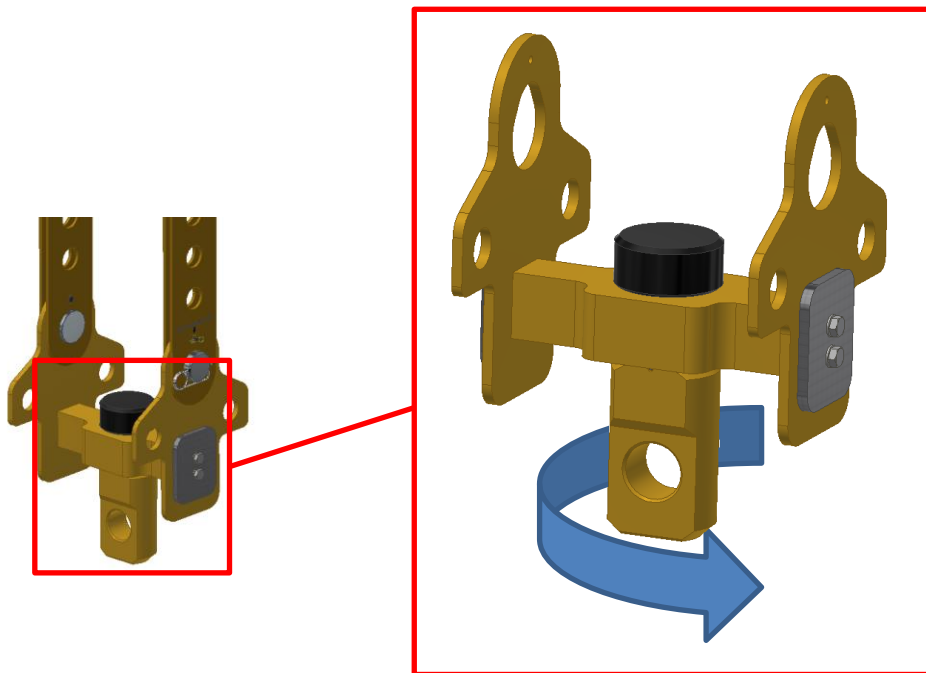
### 3.2.7.5 Rotation anchor

The rotation anchor is a device which enables you to rotate a heavy load. It is attached to a side shift unit, which on its turn is attached to a gantry system.

The rotation anchor is a passive device; it does not contain any electrics or hydraulics.

Rotation is done by hand force.

The rotation anchor can be applied for all types of side shift units.



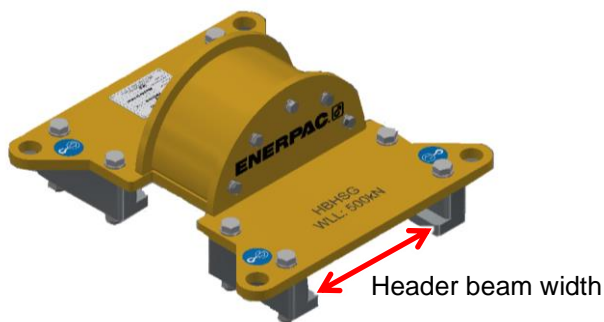
**3.2.7.6 Sling guides**

Sling guides enable suspending a load to a header beam using slings.

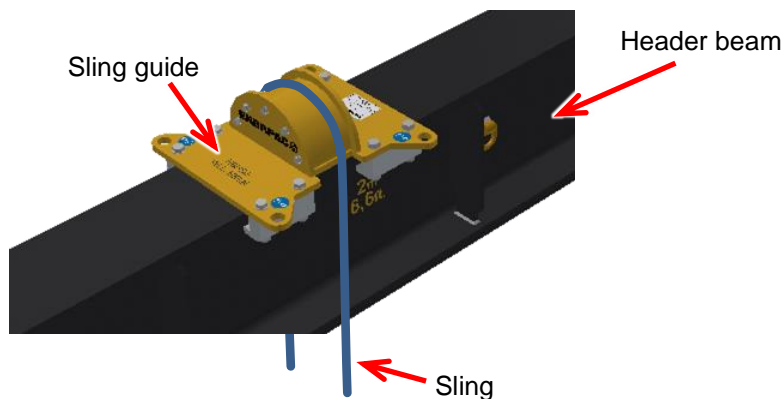
Two types of sling guides are available:

- Type HBBSG (Header Beam Box Sling Guide)
- Type HBHSG (Header Beam H Sling Guide)

They differ in bearing capacity and header beam width.




Both Sling guide types are to be mounted over the header beam. The slings are mounted over the sling guides.



### 3.3 System specifications

#### 3.3.1 Main specifications

Specification of the power source					
		SL100	SL200	SL300/SL400N	SL400
Voltage		380 to 480 V AC/ 3-phase The units feature automatic phase detection according to the rotation direction of the electric.			
Frequency		50-60 Hz			
Plug		5 pins			
Current per unit		16 A			
Power per unit		2,2 kW	3 kW	7,5 kW	7,5 kW
Fuse	Connected two by two	32 A			
	Connected individually	16 A			
Temperatures					
Operating	System incl Remote-Control unit	Min	-10°C  <b>NB:</b> Below 0° the battery of remote-control has half capacity		
		Max	+50°C		
	Hydraulic oil	Min	start up	-20°C	
		Min	operation	+10°C	
Storage	System	Min	-25°C		
		Max	+60°C		
	Remote-Control unit	Min	-25°C		
		Max	+45°C		
	Charging of Remote control	Min	0°C		
		Max	+45°C		
Hydraulic oil					
Type	Enerpac Shell Tellus S4VE46				
Minimum requirement	The purity of the medium is in accordance with: - class 10 of NAS 1638 - class 21/19/16 of ISO DIS 4406				
Volume	SL100, SL200		147 litres		
	SL300, SL400N		255 litres		
	SL400		427 litres		
Noise pressure					
Measured at ear height at nominal loading one metre away from any Unit's electric motor. (The C-weighted instantaneous sound pressure of 130 dB is never exceeded)				77 dB (A)	



**Caution:** There is a risk of ice accretion at temperatures below 0°C.  
If ice has accreted on machine components, they cannot be used since they may lock up



**NB:** Consult Enerpac if you want to apply the system by other temperatures



### 3.3.2 Functional specifications

The table shows the operational specifications of the System.

#### 3.3.2.1 SL100

<b>Moving directions of the load</b>				
Horizontally	Lateral direction	By using side shifts		
	Longitudinal direction	By moving along the skid tracks		
Vertically		By extending the cylinders		
<b>Velocities</b>				
Unit	Travelling speed	High speed	51,5 meter/hour	
		Low speed	25,6 meter/hour	
	Lifting speed	Low speed	Stage 1: Extend	442 s
			Retract	194 s
Lifting speed	High speed	Stage 2: Extend	268 s	
		Retract	148 s	
6 min				
<b>Lifting capacities</b>				
Unit	Stage 1	250 kN	2050 mm - 3400 mm	
	Stage 2	150 kN	3400 mm - 4750 mm	
Header beams	Header beams are optional parts. For bearing capacities reference is made to Ref 5 "Technical handbook".			

#### 3.3.2.2 SL200

<b>Moving directions of the load</b>				
Horizontally	Lateral direction	By using side shifts		
	Longitudinal direction	By moving along the skid tracks		
Vertically		By extending the cylinders		
<b>Velocities</b>				
Unit	Travelling speed	High speed	52,1 meter/hour	
		Low speed	32,6 meter/hour	
	Lifting speed	Low speed	Stage 1: Extend	740 s
			Retract	300 s
Lifting speed	High speed	Stage 2: Extend	348 s	
		Retract	200 s	
12 minutes				
<b>Lifting capacities</b>				
Unit	Stage 1	500 kN	2731 mm - 4716 mm	
	Stage 2	340 kN	4716 mm - 6700 mm	
Header beams	Header beams are optional parts. For bearing capacities reference is made to Ref 5 "Technical handbook".			

**3.3.2.3 SL300**

<b>Moving directions of the load</b>			
Horizontally	Lateral direction	By using side shifts	
	Longitudinal direction	By moving along the skid tracks	
Vertically		By extending the cylinders	
<b>Velocities</b>			
Unit	Travelling speed	High speed	66 meter/hour
		Low speed	29 meter/hour
	Lifting speed	Low speed	Stage 1: Extend 654 s Retract 209 s
			Stage 2: Extend 344 s Retract 184 s
	High speed	7 min	
<b>Bearing capacities</b>			
Unit	Stage 1	750 kN	2725 mm - 4625 mm
	Stage 2	500 kN	4625 mm - 6710 mm

**3.3.2.4 SL400 Narrow**

<b>Moving directions of the load</b>			
Horizontally	Transverse direction	By moving the side shifts	
	Longitudinal direction	By moving along the skid tracks	
Vertically		By extending the cylinders	
<b>Velocities</b>			
Unit	Travelling speed	High speed	66 meter/hour
		Low speed	33 meter/hour
	Lifting speed	Low speed	Stage 1: Extend 748 s Retract 181 s
			Stage 2: Extend 495 s Retract 251 s
			Stage 3: Extend 230 s Retract 191 s
	High speed	12 min	
<b>Bearing capacities</b>			
Unit	Stage 1	1000 kN	2725 mm - 4365 mm
	Stage 2	750 kN	4365 mm - 6025 mm
	Stage 3	500 kN	6025 mm - 7700 mm

**3.3.2.5 SL400**

<b>Moving directions of the load</b>				
Horizontally	Transverse direction	By moving the side shifts		
	Longitudinal direction	By moving along the skid tracks		
Vertically		By extending the cylinders		
<b>Velocities</b>				
Unit	Travelling speed	High speed	62 meter/hour	
		Low speed	31 meter/hour	
	Lifting speed	Low speed	Stage 1: Extend	969 s
			Retract	235 s
			Stage 2: Extend	618 s
		Retract	313 s	
		Stage 3: Extend	270 s	
		Retract	225 s	
		High speed	15 min	
<b>Bearing capacities</b>				
Unit	Stage 1	1000 kN	3166 mm - 5224 mm	
	Stage 2	1000 kN	5224 mm - 7232 mm	
	Stage 3	460 kN	7232 mm - 9140 mm	

**3.3.2.6 Side shift units**

<b>Velocities</b>		
Side shift	SSU125	515 mm / minute
	SSU150	515 mm / minute
	SSU300	900 mm / minute
	SSU600	900 mm / minute
<b>Bearing capacities</b>		
Side shift	SSU125	312.2 kN
	SSU150	375.0 kN
	SSU300	750.0 kN
	SSU600	1500.0 kN

**3.3.2.7 Rotation anchor**

Safe workload	750 kN
Rotation	360° both clockwise and counter clockwise

**3.3.2.8 Sling guides**

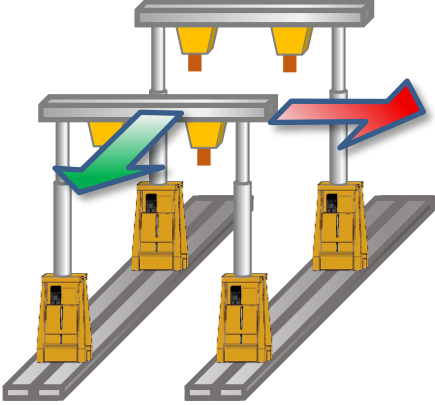
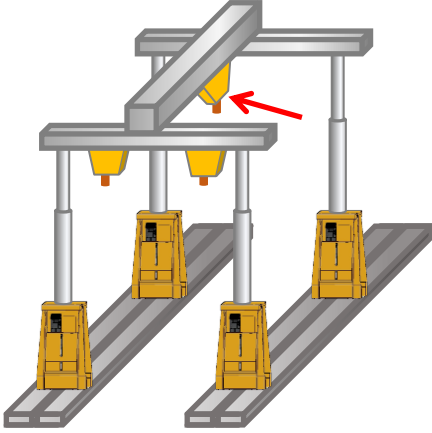
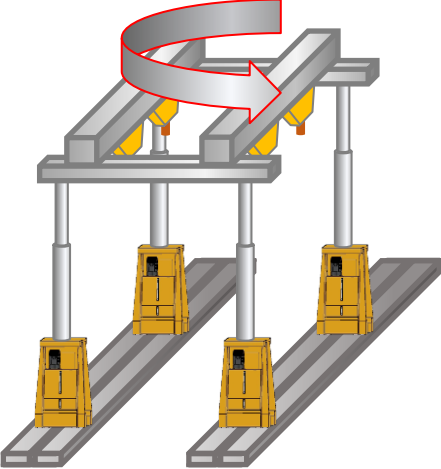
HBHSG	500 kN
HBBSG	2500 kN

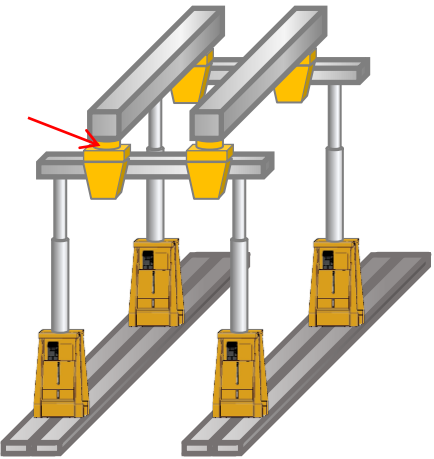
**3.3.3 Dimensions**

For dimensions and weights, reference is made to Ref 5 "Technical handbook".

### 3.4 System configurations

#### 3.4.1 Header beam configurations

<p>Commonly used configuration. Two header beams are applied, each of them connecting two units.</p> <p><b>Transverse</b> stability is provided by the beams.</p> <p>The units contribute to the <b>longitudinal</b> stability.</p>	
<p>Configuration with two header beams and one longitudinal beam.</p> <p>Three-point lifting is possible. Using three-point lifting it is easier to spread the force on the lifting slings equally.</p>	
<p>Configuration with two header beams and two longitudinal beams.</p> <p>The configuration offers increased rotational stability.</p>	

<p>Configuration with header beams mounted on top of the side shift units.</p> <p>Use is made of top swivel units which are mounted on top of the side shift units.</p> <p>The configuration enables transversal moving of the header beams.</p>	
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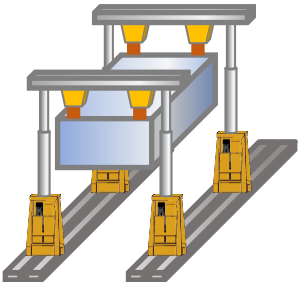

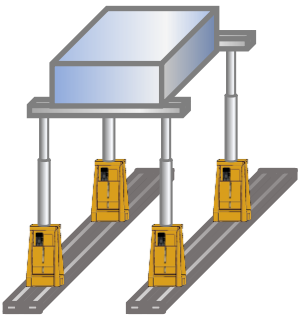
**NB:** Observe the following:

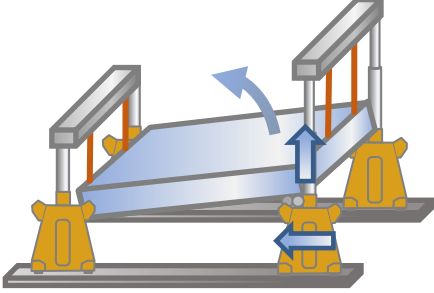

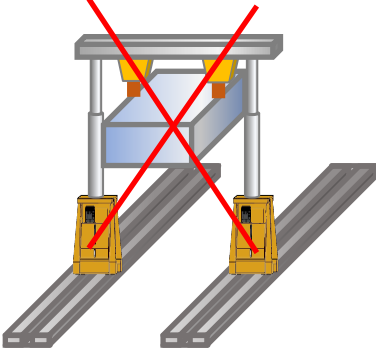
- The use of other components than purchased by Enerpac is possible as long as those components are used in accordance with their own specifications.
- When you deviate from the configurations as proposed, make sure the correct calculations are made. Enerpac may advise.
- Enerpac cannot be held responsible for the use of other configurations than the proposed.
- Contact Enerpac if you want to use other configurations than the depicted
- A configuration, in which different brand lifting equipment such as strand-jacks and skidding systems is applied, is allowed as long as all static requirements w.r.t. strength, deflections and stability are fulfilled.

### 3.4.2 Header beams

Reference is made to Appendix “Z. Compatibility of system parts”.

## 3.5 Position of the load

<p>The system can lift a load if it is suspended from the header beams.</p>	
<p>If you want to put the load on top of the header beams, contact Enerpac for advice.</p> <p> <b>Caution:</b> This configuration is less stable.</p>	

<p>The system is able to tilt (rotate) a load. Two units are lifting the load upwards and travel simultaneously. The other two units stay passive.</p>	
<p>The system is exclusively suitable for four-leg lifting.</p> <p> <b>Hazard:</b> Using the system with only two legs may cause instability.</p>	



**NB:** Enerpac can advise you when you want to use the System in other configurations than the proposed ones.

## 3.6 Service conditions

- The System is intended for hoisting loads. Do not use the System for any other purpose.
- No alterations may be made to the System. Only use the System as it was delivered.



**NB:** The System is explicitly **not intended** for hoisting people.



**Hazard:** using the System for other purposes than the intended use may cause hazards to personnel and may cause damage to the equipment.



**Hazard:** Lifting a load with **less than four units** is hazardous and therefore prohibited.

The System with its load can tip-over due to

- out of centre of gravity
- swinging of the load
- large sling angles

The operation may cause injury to people and may cause even death.

## 4 Plan an operation

In this chapter, the planning activities for a lifting operation are described. Record the preparation in the checklist given in Appendix A “Checklist for planning”.

- Type of operation
  - Lift / lower
  - Move in longitudinal direction
  - Move in transversal direction
- The system
  - Lifting capacity of the most heavily loaded unit
  - Capacity of the header beams
  - Minimum force on each unit sufficient
  - Maximum force per anchor or side shift does not exceed the max
  - The force on the header beam does not exceed the max
- Side shift unit
  - Required capacity
  - Rotation anchor applied? If so, can the load be turned without hitting any obstacle?
  - Is there enough space for personnel to pull the load around?
  - Top swivels applied?
  - Extended anchor plates for side shift units applied?
- The load
  - Mass of the load
  - Centre of gravity of the load with respect to the units
  - Dimensions of the load
- The side load
  - (See section 4.5 “Side load”)
- The operation
  - Determine the lifting height
  - The travelling distance
  - Stage extension
  - Capacity in highest stage
- The environment
  - Bearing capacity of the subsoil.
  - Is additional supporting material underneath the skid tracks necessary?
  - The wind load:
    - X direction
    - Y direction



**NB:** It is of the utmost importance to read this whole chapter carefully before starting the lifting operation.



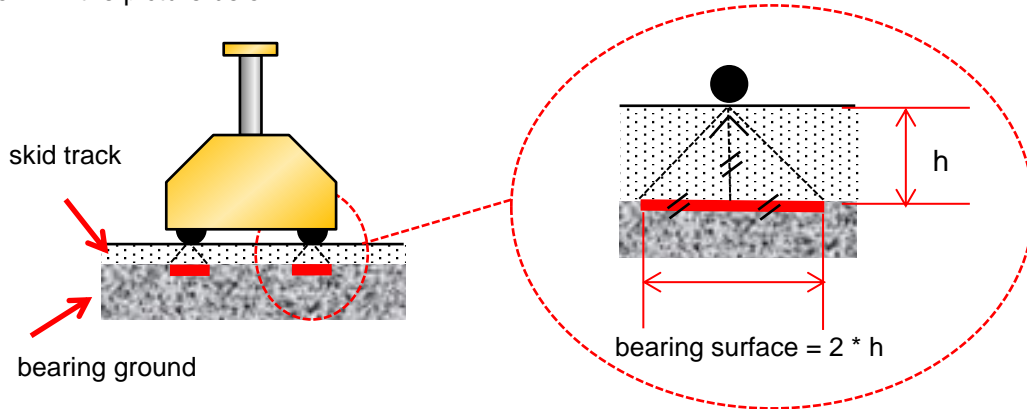
**Hazard:** failure to prepare a lifting operation correctly may result in loss of System stability.

## 4.1 Bearing ground pressure calculation

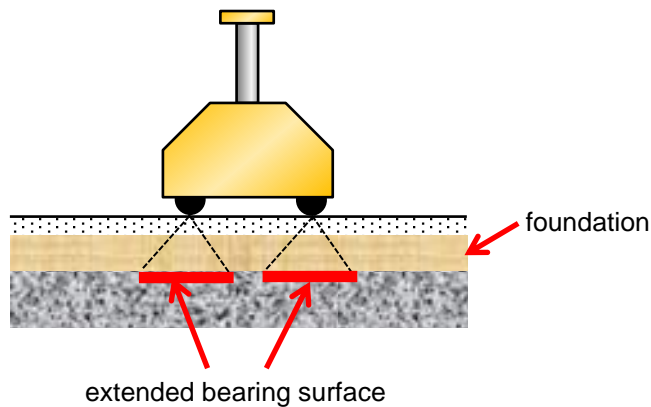
For bearing ground calculations use is made of the effect that pressure spreads down in an angle of 45°.

The skid tracks can be put

- directly on the subsoil  
The bearing surface in length direction for one wheel is two times the height of the skid track, as shown in the picture below.



- on a foundation:  
to compensate unevenness in the subsoil  
to reduce the bearing pressure.
- The bearing surface in length direction for one wheel is two times the height of (skid track plus foundation), as shown below.



 **NB:** The pressure on the subsoil is inverse proportional with the height of the foundation

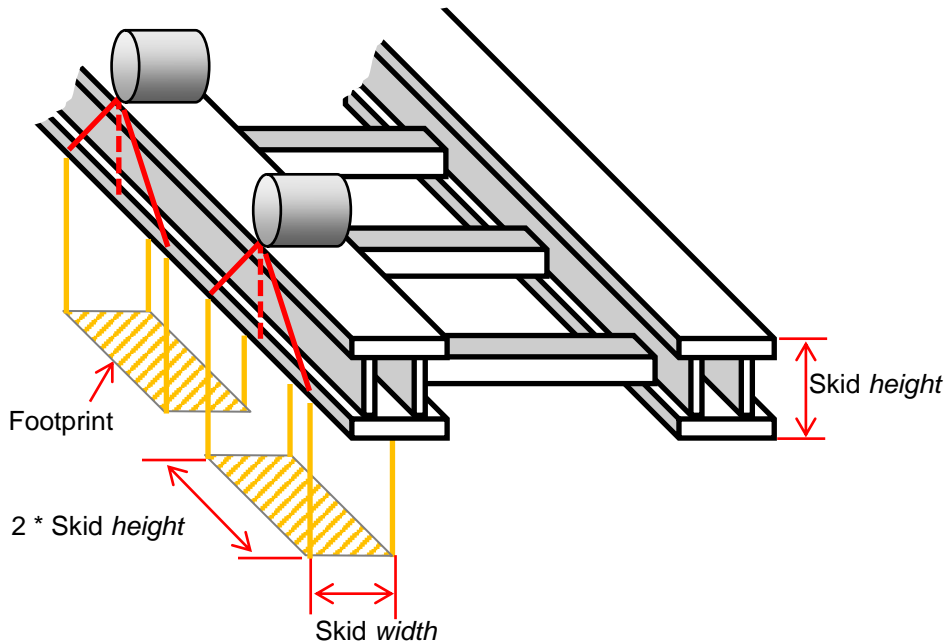
The following sections describe in detail how ground bearing pressure can be calculated.

 **NB:** Feel free to apply your own calculation methods for ground bearing pressure.



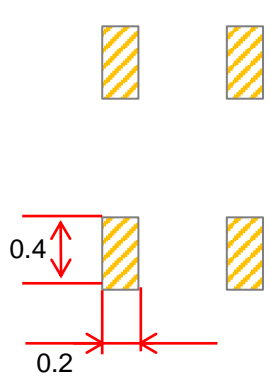
## 4.1.1 No foundation applied

The dimensions of the bearing surface are as follows:



To calculate the bearing pressure, you *might* use the following procedure:

Parameter	Abbrev	Value
Skid track	height	Skid height
	width	Skid width
Own mass of one unit	Mass unit	2.13 metric ton (see Ref 5 "Technical handbook")
Mass of auxiliary material (beams, shackles etc)	Mass Aux	15
Safety factor	S	1.7
Maximum force on <b>one unit</b> which can occur during the operation [kN]	F	Depends on the operation

1.	Bearing surface, including the spreading effect in length direction, of <b>one unit</b>	 <p>4 wheels * 0.2 * 0.4 = 0.32</p>
2.	Pressure on the ground [metric tonnes / m <sup>2</sup> ]	$\sigma = \frac{F + Mass_{unit} + \frac{Mass_{aux}}{4}}{Bearing\ Surface} \cdot Safety\ factor$



Example:

Load to be lifted

45 metric tons

Ground pressure

$$\sigma = \frac{45/4 + 2.2 + 15/4}{0.32} * 1.1 = 91.4 \text{ metric tons / m}^2$$

**NB:** Complete the checklist in Appendix A “Checklist for planning”



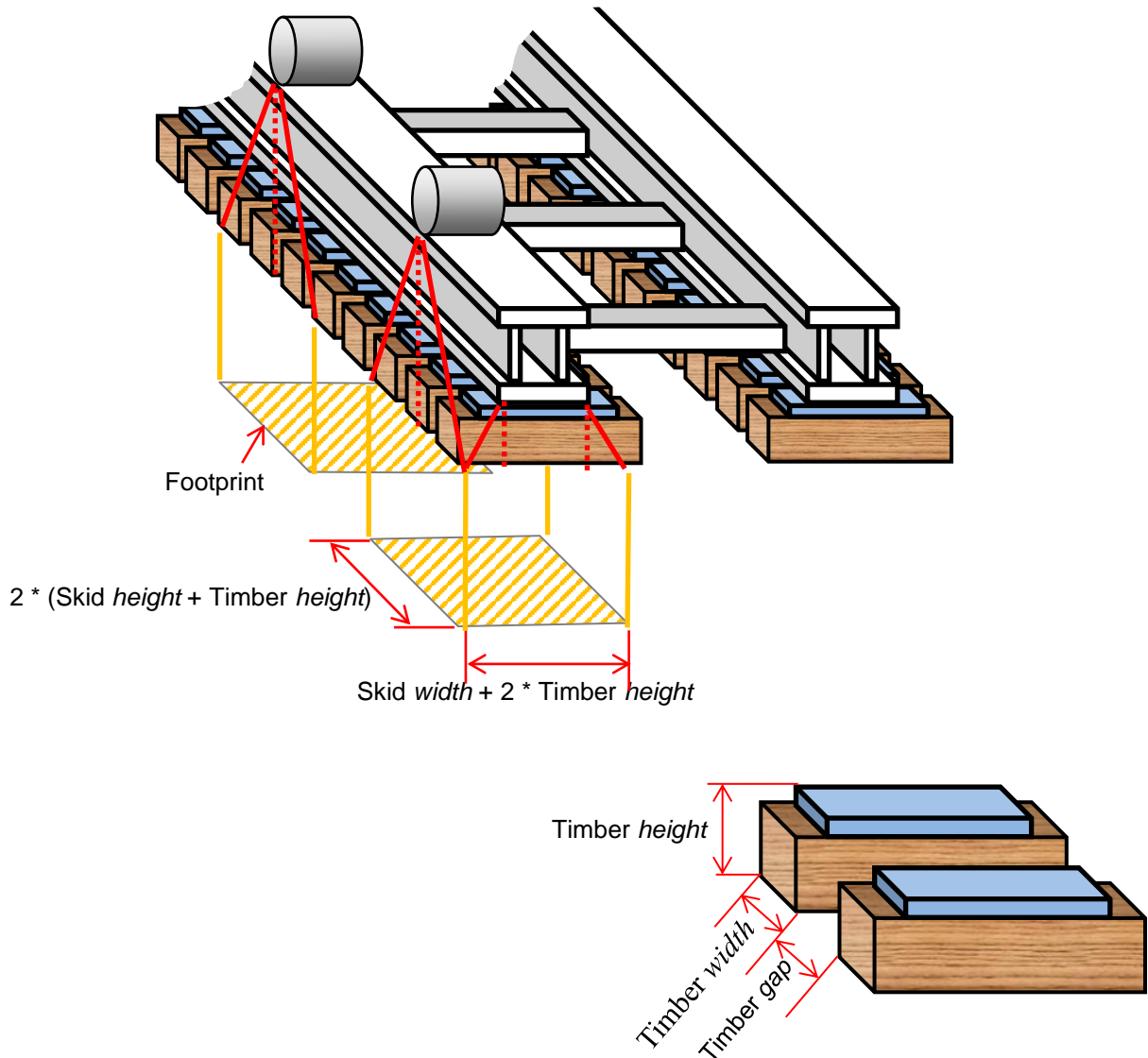
**Attention:** the exerted ground pressure may never exceed the bearing capacity of the subsoil.

**4.1.2 Foundation applied**




In order to reduce the bearing ground pressure, timbers of hard wood can be applied as foundation material.

**NB:** It is recommended to put steel plates between the timbers and the skid tracks. The dimensions of the bearing surface are as follows:



To calculate the bearing pressure, you might use the following procedure:

Parameter		Abbrev	Value
Skid track	height	<i>Skid height</i>	0.2 [m]
	width	<i>Skid width</i>	0.2 [m]
Timber	height	<i>Timber height</i>	Depends on the operation
	width	<i>Timber width</i>	
	gap	<i>Timber gap</i>	
Own mass of one Unit		Mass unit	2.13 metric tons (see Ref 5 "Technical handbook")
Mass of auxiliary material (beams, shackles etc)		Mass Aux	15
Safety factor		S	1.7
Maximum force on <b>one Unit</b> which can occur during the operation [kN]		F	Depends on the operation

1.	Surface of one footprint = width * length	$(\text{Skid width} + 2 * \text{Timber height}) * [2 * (\text{Skid height} + \text{Timber height})]$
2.	The bearing surface of <b>one Unit</b> is formed by <b>four footprints</b>	
3.	Support ratio, to correct for the gaps between the timbers	Support_Ratio = $\text{Timber width} / (\text{Timber width} + \text{Timber gap})$
4.	Pressure on the ground [metric tonnes / m <sup>2</sup> ]	$\sigma = \frac{F + \text{Mass}_{unit} + \frac{\text{Mass}_{aux}}{4}}{\text{Bearing Surface} \cdot \text{Support Ratio}} * S$

**Example:**

Load to be lifted 125 metric tons

Timbers:      Width            0.10 m  
                   Height            0.10 m  
                   Gap                0.05 m

Measures of one footprint:

Width:       $\text{Skid width} + 2 * \text{Timber height} = 0.2 + 2 * 0.1 = 0.4 \text{ m}$

Length:      $2 * (\text{Skid height} + \text{Timber height}) = 2 * (0.2 + 0.1) = 0.6 \text{ m}$

Surface:     $0.4 * 0.6 = 0.24 \text{ m}^2$

Four footprints       $4 * 0.16 = 0.96 \text{ m}^2$

Support ratio         $0.10 / (0.10 + 0.05) = 0.67$

Ground pressure       $\sigma = \frac{125/4 + 2.13 + 15/4}{0.96 * 0.67} * 1.7 = \mathbf{98 \text{ metric tons / m}^2}$



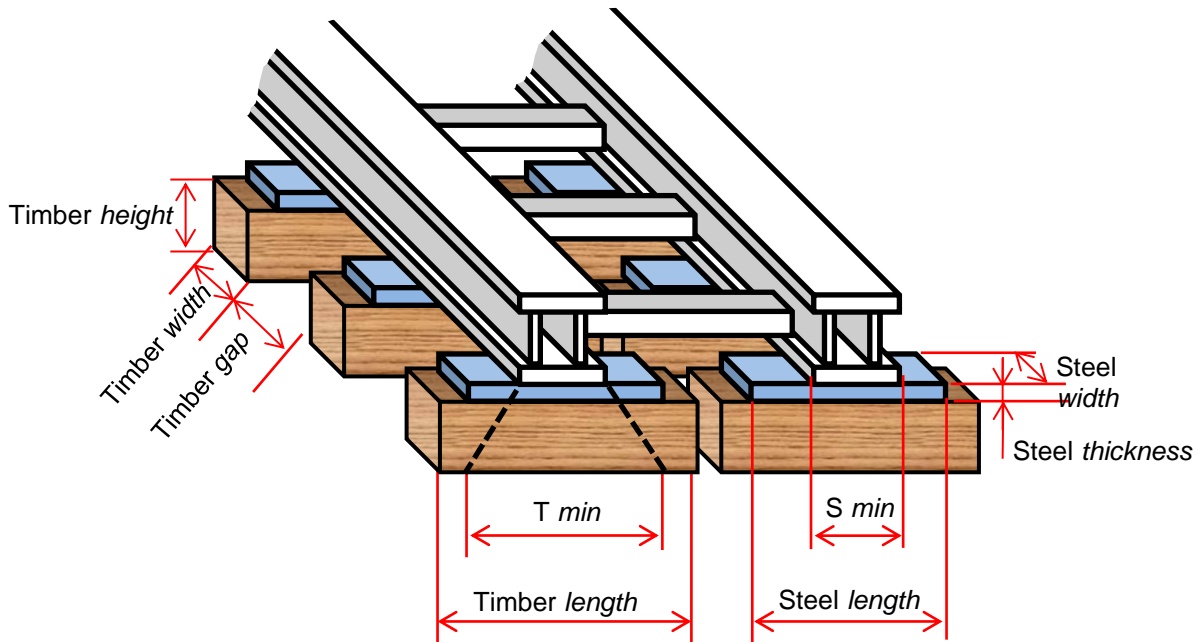
**NB:** Complete the checklist in Appendix A “Checklist for planning”




**Attention:** the exerted ground pressure may never exceed the bearing capacity of the subsoil.


**4.1.3 Requirements for foundation material**


The foundation material has to meet the The skid tracks shall have no skew requirements:




Parameter		Requirement
Timbers	Timber length	> $T_{min}$ < 612mm
	Timber width	> Timber height
	Timber gap	< Timber width and < 50 mm
	mechanical compressive strength	> 8 N/mm <sup>2</sup> without occurrence of deflection  <b>NB:</b> Enerpac strongly recommends adhering to 13N/mm <sup>2</sup> , preferably Azobé wood
Steel plates	Steel length	> $S_{min}$
	Steel width	≥ Timber width
	Steel thickness	> 10 mm (Preferred)
	mechanical compressive strength	> 30 N/mm <sup>2</sup> without occurrence of deflection
	Mounting	properly secured
Steel shims (see below)	mechanical compressive strength	> 30 N/mm <sup>2</sup> without occurrence of deflection

Steel shims can be used to level the skid track, and to fill openings between the floor and the skid track. These openings may occur due to thickness tolerances in the timber and the track, and due to the imperfect flatness of the floor.

 **NB:** The entire contact surface between the skid track and the floor, or the skid track and the timbers must be filled.

 **NB:** Wood is a natural product: its quality is not assured. In order to guarantee quality, test the timbers on 125% of the expected load. For your planning keep in mind that suitable wood may not always be available immediately.

 **Attention:** use of other wood types such as plywood, multiply, pine and compressed wood is **explicitly prohibited**.

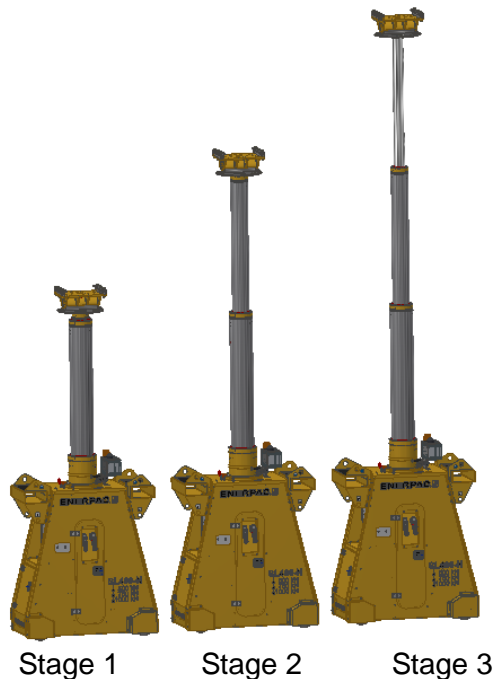
## 4.2 Check the lifting capacity of the system

This chapter describes how to determine the lifting capacity of the system.

The lifting height influences the lifting capacity.

### 4.2.1 Maximum load

The bearing capacity of the System depends on the degree of extension of the Cylinders: the more extension, the less bearing capacity.



Complete the checklist in Appendix A “Checklist for planning” under “Stage of Extension”.

#### 4.2.1.1 The maximum load per unit.

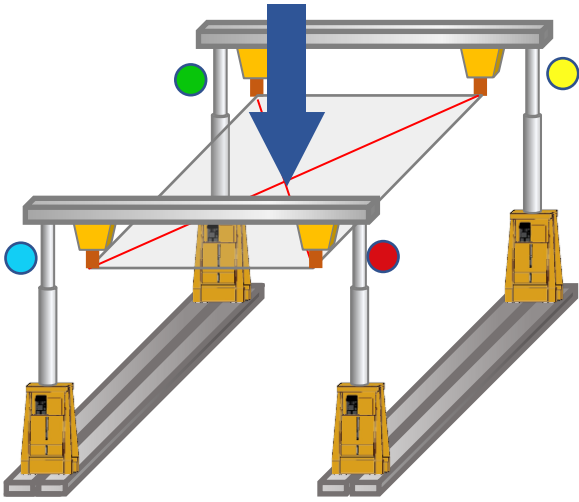
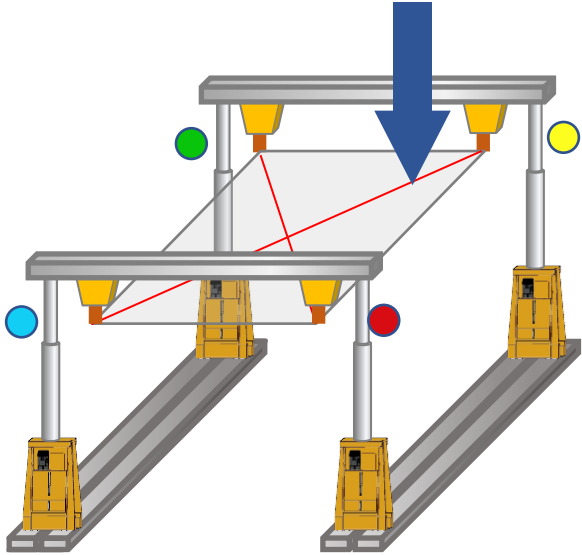
The bearing capacity per stage and per unit is given in the table of section 3.3.2 “Functional specifications”.



**NB:** The capacity of a System is four times the maximum load on one Unit.

**4.2.1.2 Use of load charts**

When the centre of gravity is not in the centre of the System, the capacity of the system will decrease. The figures below give the principle of it. The numbers are fictitious.

Assume <ul style="list-style-type: none"> <li>• a load of 400 kN</li> <li>• a bearing capacity per unit of 100 kN</li> <li>• stage 2 used</li> </ul>	
The centre of gravity of the load is in central position.	The centre of gravity of the load is in eccentric.
	
(The coloured bullets match with the load chart)	
The load is spread <b>equally</b> over the units: All Units bear $400 / 4 = 100$ kN	The load is spread <b>unequally</b> over the units. The load on the rear-right unit has increased significantly and exceeds 100 kN
The system is loaded to its limits, but none of the units is overloaded.	The rear-right unit is <b>overloaded!</b> The system cannot lift the 400 kN anymore but less, to avoid overload in that unit. <i>The capacity of the system has decreased due to eccentricity of the load.</i>

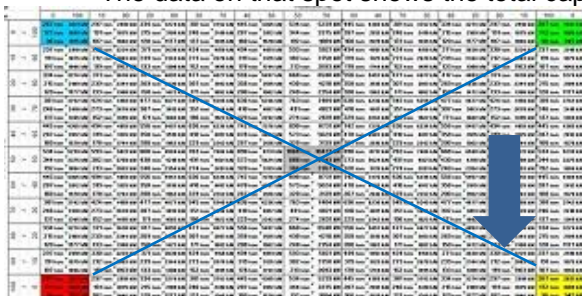


**Conclusion:** The more eccentric the centre of gravity, the less the bearing capacity of the system.

The load charts for each system are given in ref 5 “Technical handbook”.

Use the load chart as follows for your side shift operations:

- Locate the position of the centre of gravity in the load chart, as shown at the right.
- The data on that spot shows the total capacity (4 units) of the system.



## 4.2.2 Minimum load

When the load is only little, the motion of the first and the second section may not be exactly smooth, due to friction of the hydraulic cylinders.

To ensure a smooth motion, the units have to bear a minimum load of 50 kN. In most cases, the weight of the header beams is sufficient.

Enter the minimum load in the checklist in Appendix A “Checklist for planning”. Do such for the unit which is bearing the lightest load only.

## 4.3 Side Shift units, Lugs and Sling guides

### 4.3.1 Side shift units

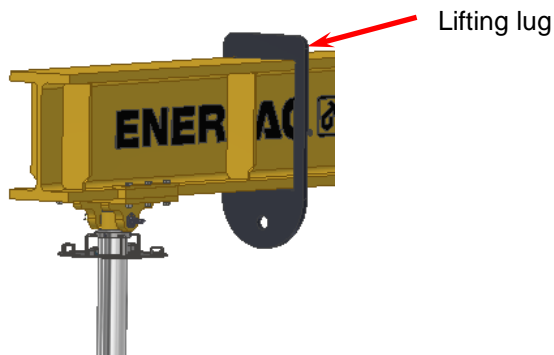
When you want to move the load in transverse direction then apply the side shift units. Verify their bearing capacity. It is given in Appendix Z. Compatibility of system parts.

**NB:** Always determine the force on the side shift unit, even for relatively light loads. In case of any doubt, consult Enerpac.

**Caution:** the force on the side shift units shall never exceed their bearing capacity.

### 4.3.2 Lugs

If there is no need to move the load in transverse direction then the Lugs can be applied. Check the capacity of the lugs. Use the information in Appendix “Z. Compatibility of system parts”. Enter the load in the checklist given in Appendix A “Checklist for planning”



### 4.3.3 Sling guides

If you want to suspend a load directly to the header beams by using slings, then apply sling guides.

**Warning:** Never suspend a load to the header beam using slings without applying sling guides.



## 4.4 The bearing capacity of the header beams

The bearing capacity of the main header beams depends on position of the load: the closer to the centre, the less the capacity of the header beam.

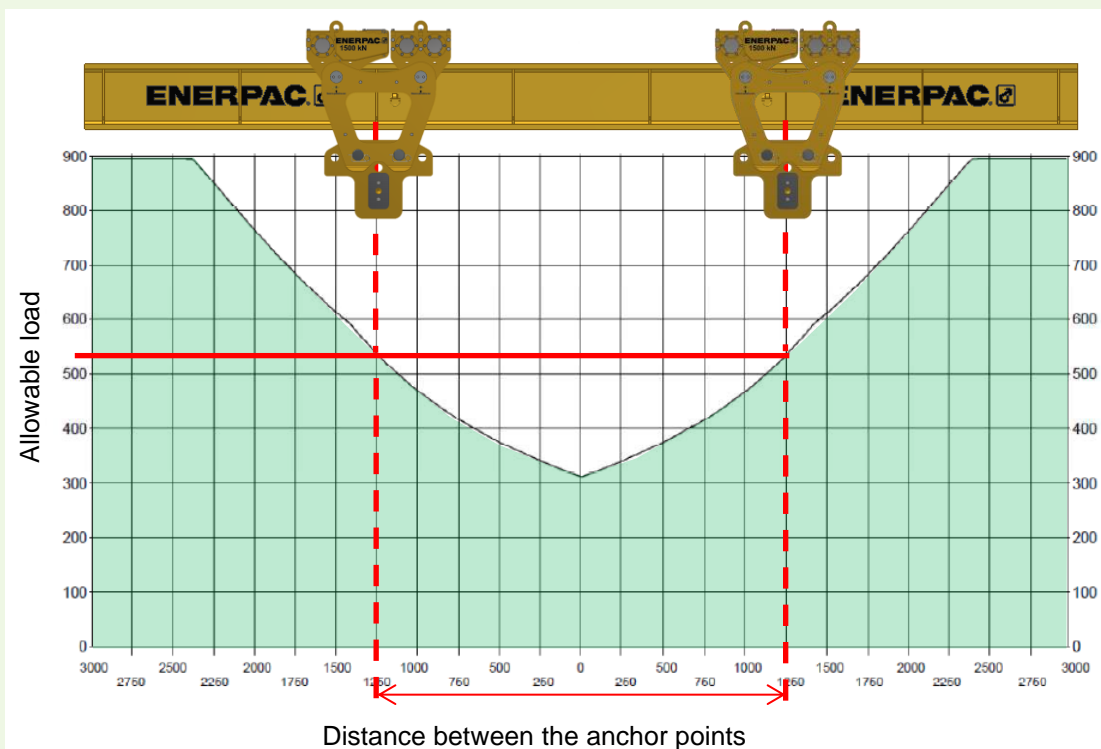
The capacities of the header beams in relation to the position of the load are given in the load charts in ref 5 "Technical handbook".

The bearing capacity of the beam is twice the indicated capacity if

- only one anchor point is used and
- the anchor point is in the centre of the beam.

This is depicted below:

**Example** how to determine the bearing capacity of the header beam for two anchor points. Loads within the green area are allowed.



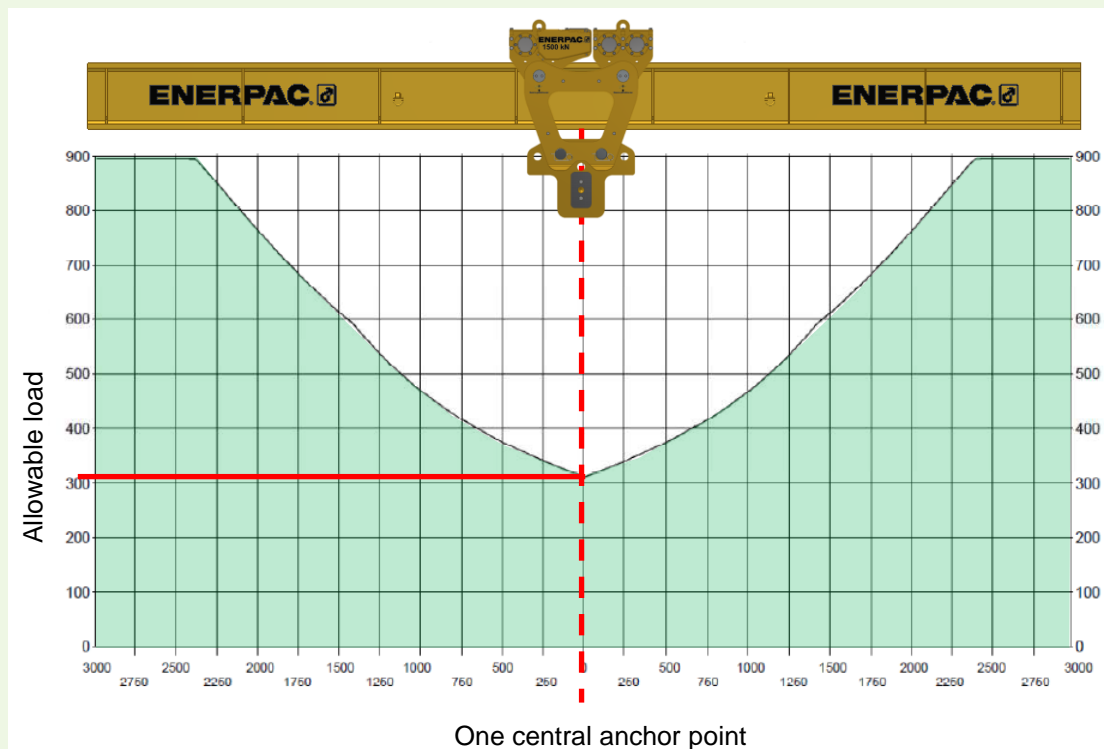
The distance between the anchor points is (1250 + 1250) mm, so the maximum allowable load is 520 kN per anchor point.

The bearing capacity of the beam is twice the indicated capacity if

- only one anchor point is used and
- the anchor point is in the centre of the beam.

This is depicted below:

**Example** how to determine the bearing capacity of the header beam for one anchor point. Loads within the green area are allowed.



In this example the total allowed load is  $2 \times 300 = 600$ .

Enter the beam load in the checklist given in Appendix A “Checklist for planning”

**Caution:** The force on each anchor point shall not increase the capacity of the header beam.

**NB:**

- Earlier purchased Enerpac / Hydrosplex Header Beams may be applied if their capacity is sufficient.
- Header beams of different brand can be applied if their capacity is sufficient, but Enerpac will not take any responsibility for it.

## 4.5 Side load

Side load may endanger the stability of the System.

Side load can be caused by

- Wind
  - Size of the object
  - Windspeed
  - Height of the header beams
  - Lifting height
- Bearing ground not levelled out
- System not mounted plumb
- Inclination of the skid tracks
- Slings or shackles which are not mounted plumb between the side shift units (or lugs) and the load.
- Deflections of the load might cause side load into the system. These need to be considered in the total acceptable side load percentage. Especially for long and slender loads this effect can be significant.

To calculate the permissible wind speed, reference is made to ref 4 “Wind calculations”.

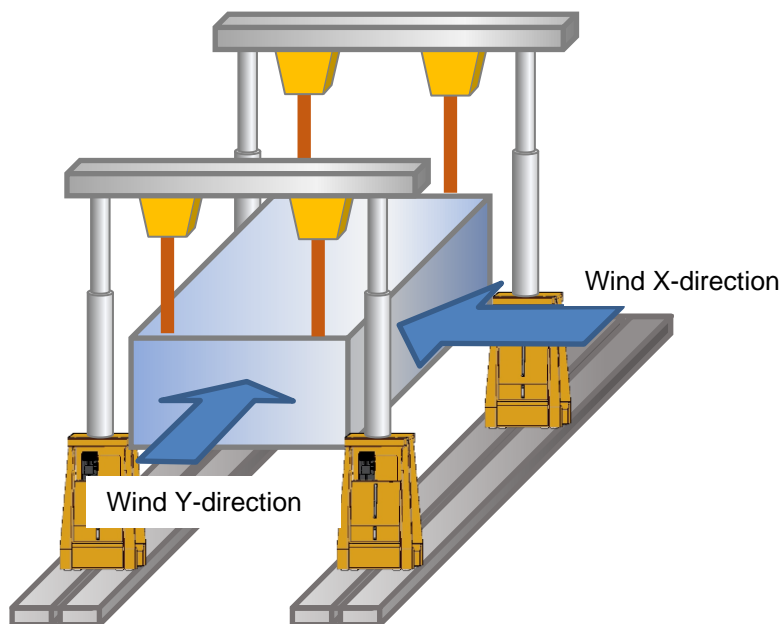


**Attention:** The side load shall not exceed 1.5% of the actual load.

Enter the maximum permissible wind speed in Appendix A “Checklist for planning”



**Attention:** Calculation of the side load is the **exclusive responsibility** of you as the user of the system.



**NB:** Always assume the most adverse situation

Enter the maximum permissible wind speed in Appendix A “Checklist for planning”



**Hazard:**

- Under no circumstances whatsoever may lifting operations be carried out when the wind speed is greater than the permissible values.
- When lifting, always assume a worst-case scenario. Wind is unpredictable and may quickly change speed and direction.

## 5 Install the System

This chapter describes how to install the System as well as the preparations which have to be made for the working location.

Fully complete the checklist as given in Appendix A “Checklist for planning”



**NB:**

Verify the lifting capacity of your lifting means with reference to the weight of the parts to be hoisted. The weights are given in Ref 5 “Technical handbook”.

For torque settings reference is made to Appendix G “Torque settings”.

### 5.1 Hoisting Instructions

#### 5.1.1 Transporting a unit

Pre-conditions for moving a unit:

- no header beams mounted
- no load attached
- no electrics connected
- the cylinder is fully retracted

Transporting a unit in vertical position can be performed by

- Using a forklift truck.  
Use the fork holes of the unit.



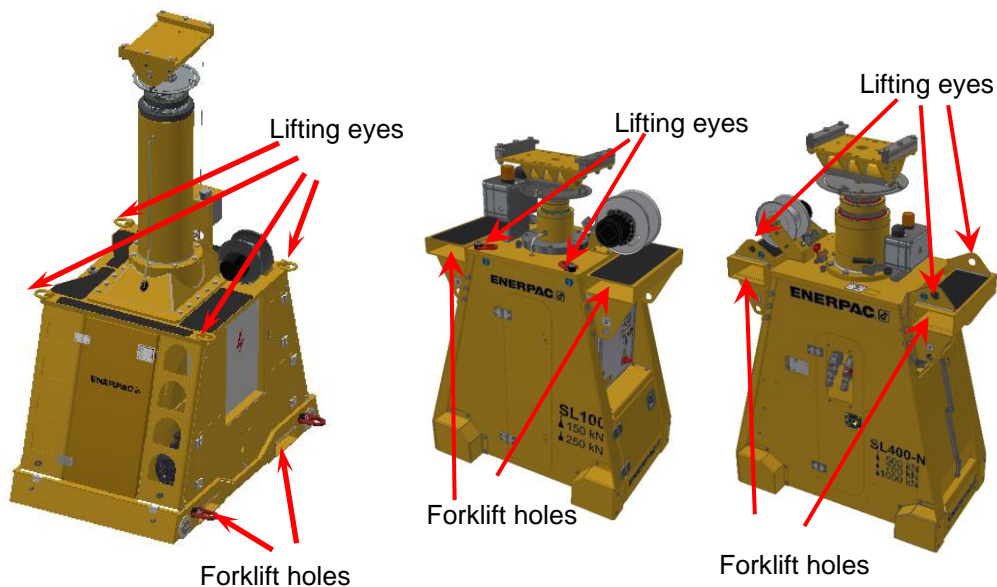
**Attention:**

- In order to prevent damage to the wheels of the units, keep the bottom of the unit at a height of at least 300 mm.
- the unit should not lean back

- Using a crane  
Use the lifting eyes of the unit.



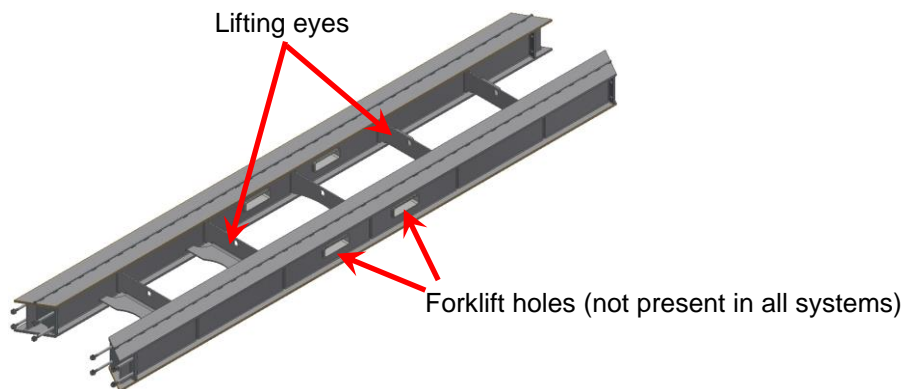
**Attention:** always use four lifting eyes



## 5.1.2 Hoisting skid tracks

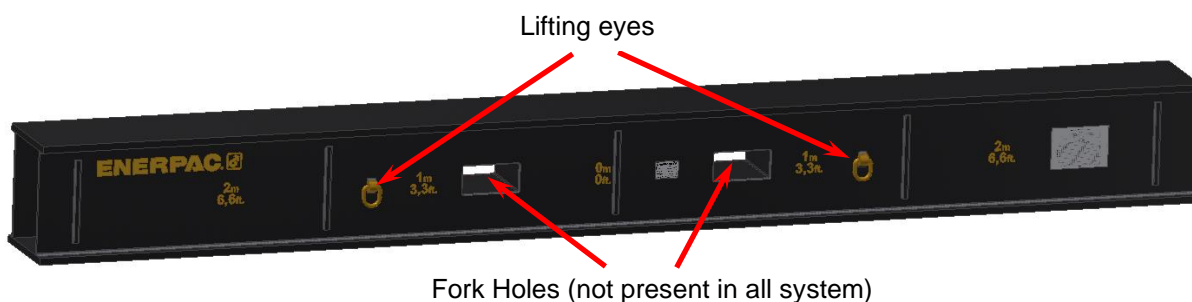
The skid tracks can be hoisted:

- by a forklift truck.  
Use the fork holes
- by a crane.  
Use both lifting eyes.



## 5.1.3 Hoisting header beams

Header beams are provided with lifting eyes, and sometimes with fork holes.

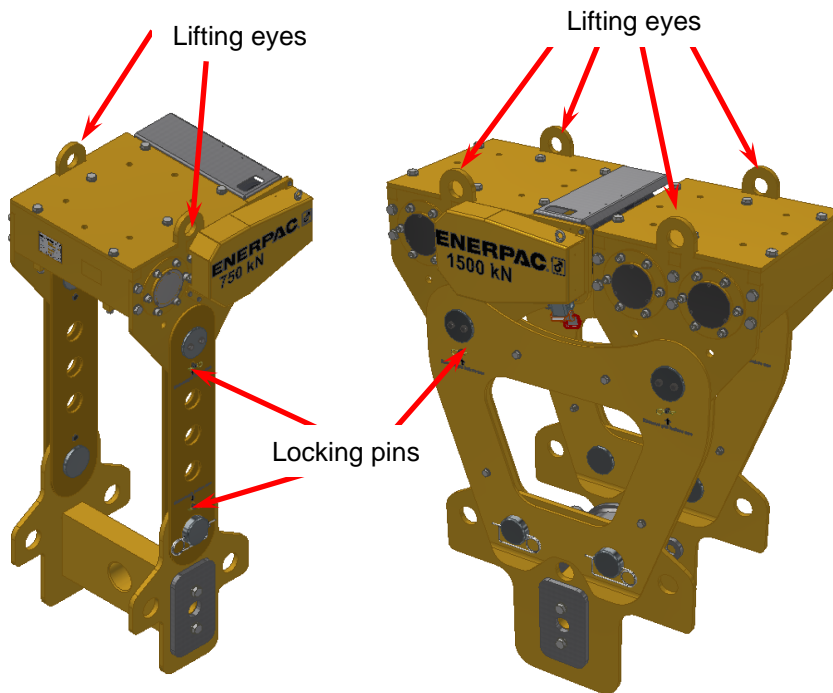


## 5.1.4 Hoisting a side shift unit

To hoist the side shift units, observe the following.


### 5.1.4.1 SSU300

The side shift units shall only be hoisted using the lifting eyes.



To take the side shift unit out of the transportation frame proceed as follows:

1.	Put the transportation frame next to the gantry. Preferable apply a <b>forklift</b> . Eventually you can use a crane and use the lifting eyes.
2.	At delivery, the side shift units are strapped to the strap-down eyes. Remove those straps.
3.	Make sure the locking pins are in place on both sides of the side shift unit.
	<p>The image shows three views of the side shift unit. The top left view is a close-up of the 'ENERPAC 1500 kN' unit with a red arrow pointing to a locking pin. The top right view is a close-up of the 'ENERPAC 750 kN' unit with a red arrow pointing to a locking pin. The bottom view shows the unit mounted on a transportation frame with red arrows pointing to the locking pins on both sides.</p>
4.	Hoist the side shift unit out of the transportation frame.
5.	After positioning the side shift unit, remove the locking pins on both sides.

6. Store the locking pin in one of the pipes	
--	---

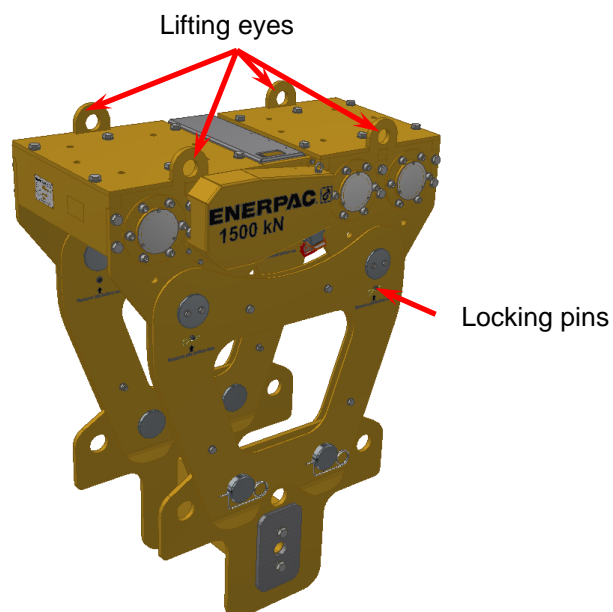
For storing the side shift units in the transportation units, proceed in reverse order.

**Attention:**

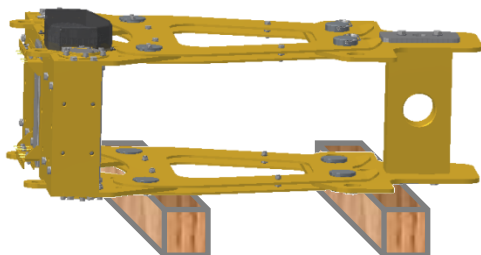
- The height of the transportation frame is adjustable. Make sure the height is set in such a way that the side shift units cannot touch the ground.
- Strap the side shift units to the strap-down eyes.

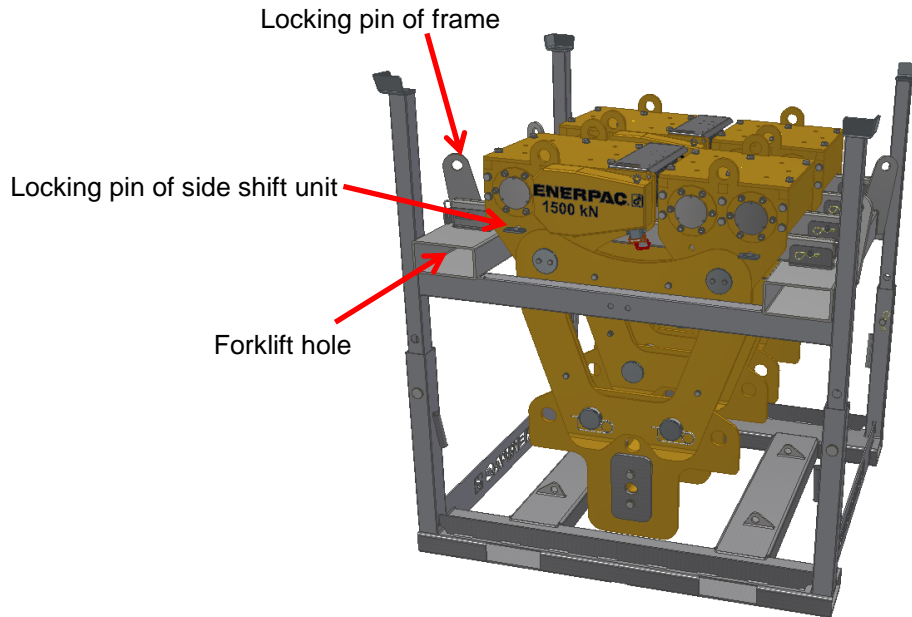
**5.1.4.2 SSU600**

The side shift units shall only be hoisted using the lifting eyes. The locking pins must be used, otherwise the driven and undriven unit collapse with each other.

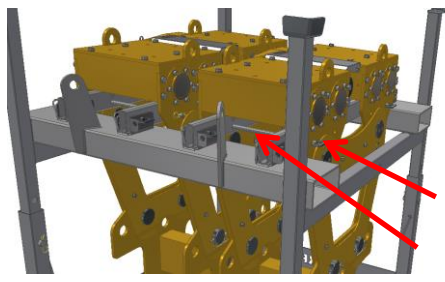



When not in use then put the side shift units into the transportation frames or put them down horizontally on timbers.





To take the side shift unit out of the transportation frame proceed as follows:

1.	Put the transportation frame next to the gantry. Preferable apply a <b>forklift</b> . Eventually you can use a crane and use the lifting eyes.	
2.	At delivery, the side shift units are strapped to the strap-down eyes. Remove those straps.	
3.	Make sure the locking pins of the side shift unit are in place on both sides of the side shift unit.	
4.	Remove the locking pins of the frame, on both sides.	
5.	Store the locking pin in one of the pipes	
6.	Hoist the side shift unit out of the transportation frame. Use all lifting eyes.	
7.	After positioning the side shift unit, remove the locking pins of the side shift unit on both sides.	

For storing the side shift units in the transportation units, proceed in reverse order.



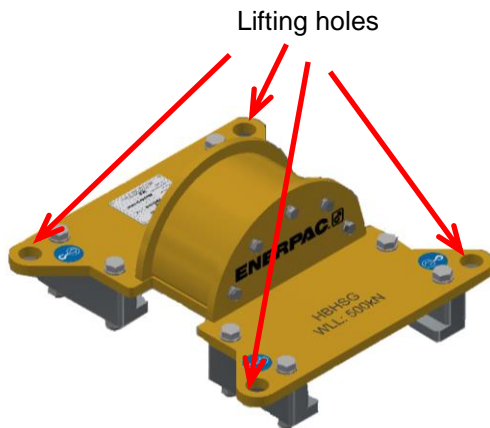
**Attention:**

- The height of the transportation frame is adjustable. Make sure the height is set in such a way that the side shift units cannot touch the ground.
- Strap the side shift units to the strap-down eyes.



## 5.1.5 Hoisting sling guides

Use slings to hoist sling guides. The lifting eyes and lifting holes are indicated below.



## 5.2 Place the skid tracks

Correct positioning of the skid tracks ensures that the system is put level on the ground. When the ground is not flat then grade it in advance, to create a solid foundation on which the system can operate safely.



**Attention:** creating a proper foundation has to be performed with utmost care, as it is the system's primary safety issue. The foundation of the Skid tracks is the exclusive responsibility of the user.

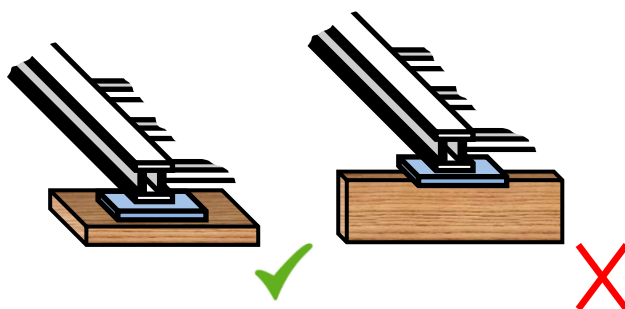
### 5.2.1 Build the foundation

For building the foundation, proceed as follows:

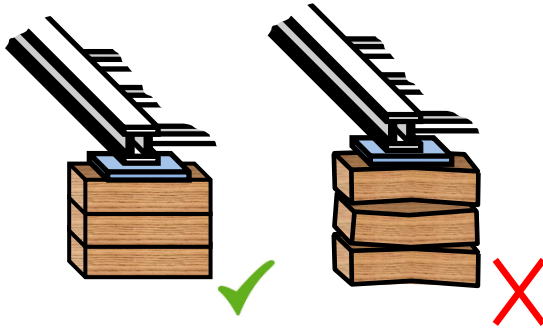
Install the foundation material as you determined; see section 4.1 "Bearing ground pressure calculation".

Observe the following:

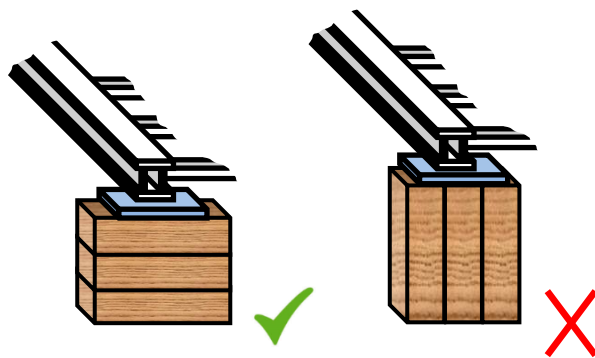
- If the diameter of the timbers is not square, then put them in flat position.



- If you stack timbers then leave no slack in between, to avoid risk of spring.



- Put the timbers horizontally, not vertically.

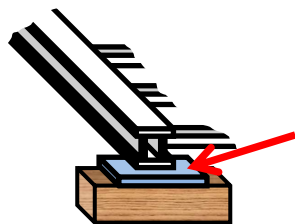


## 5.2.2 Put the skid tracks in place

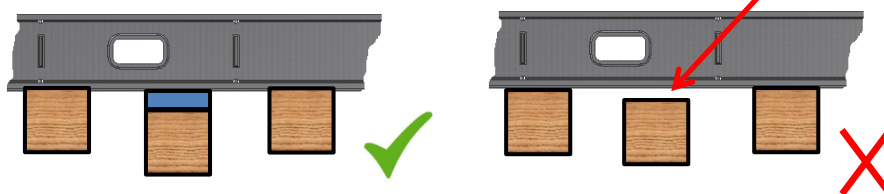
For putting the skid tracks in place, proceed as follows:

Put the skid tracks on the foundation and mount them together.  
Observe the following:

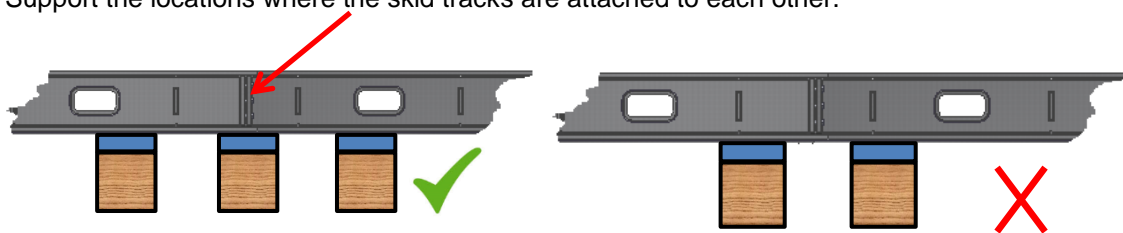
- Put steel plates between the timbers and the skid tracks



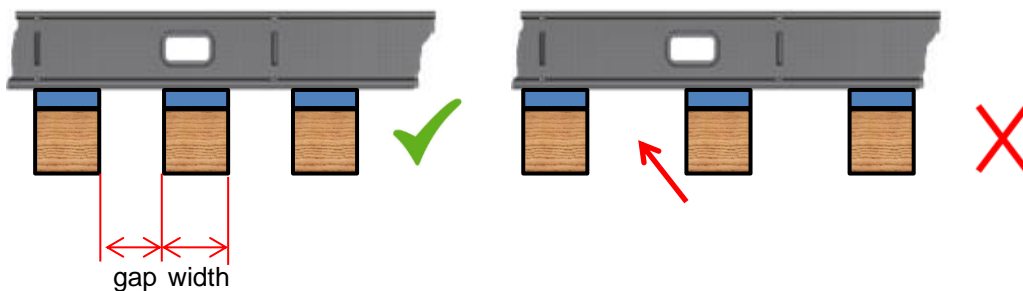
- Make sure no slack is left between the foundation and the skid tracks. Eventually use shims.



- Support the locations where the skid tracks are attached to each other.

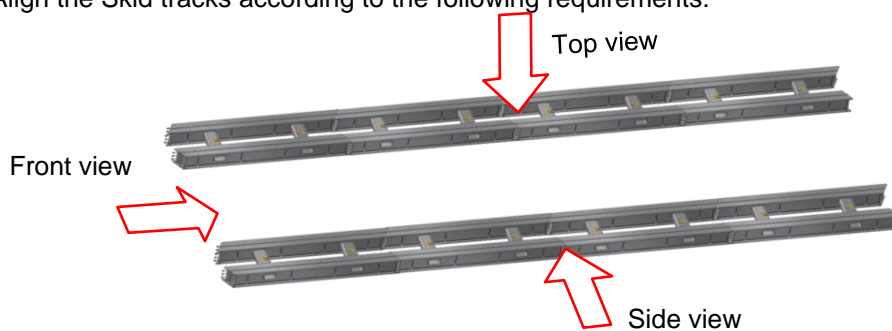


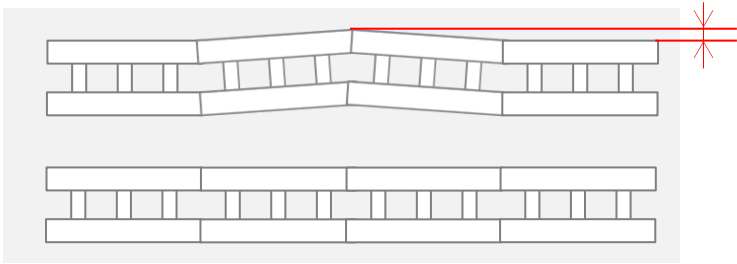
- The gap between the timbers shall be smaller than the width of the timbers.

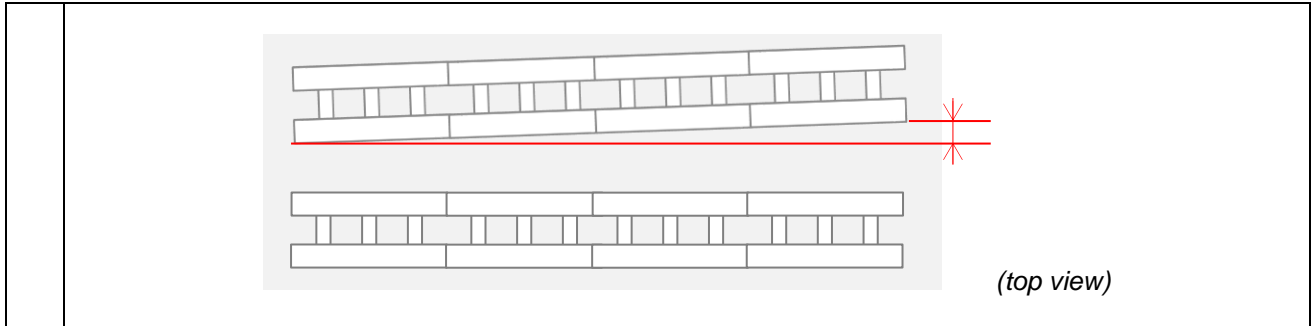


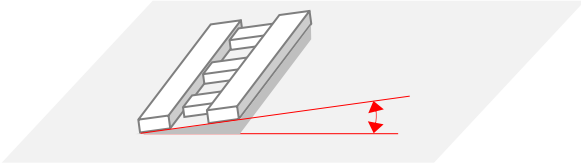
### 5.2.3 Align the skid tracks

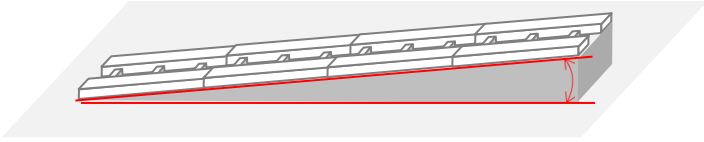
Align the Skid tracks according to the following requirements:

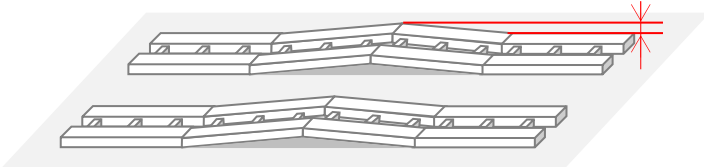


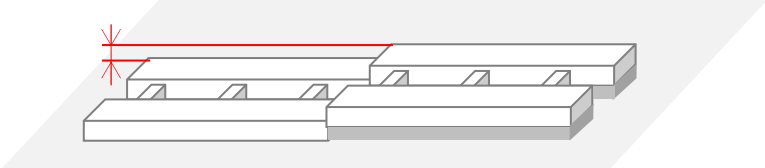
Nr	Alignment requirement	Tolerance
1	The skid tracks shall be in parallel	12 mm
 <p style="text-align: right;">(top view)</p>		
2	The skid tracks shall be aligned from the start to the end	12 mm



3	The skid tracks shall have no skew more than ...	0.2°
 <p>(front view of one skid track)</p>		

4	The skid tracks shall not incline	0.2°
 <p>(side view of one skid track)</p>		

5	The skid tracks shall be flat.	5 mm over 3 meter
 <p>(side view of one skid track)</p>		

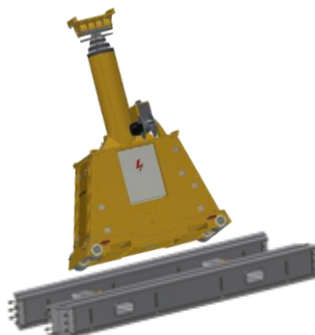
6	The surfaces of the segments of the skid tracks shall be well aligned. <i>Use shims if necessary</i>	-
 <p>(side view of one skid track)</p>		

## 5.3 Position the units

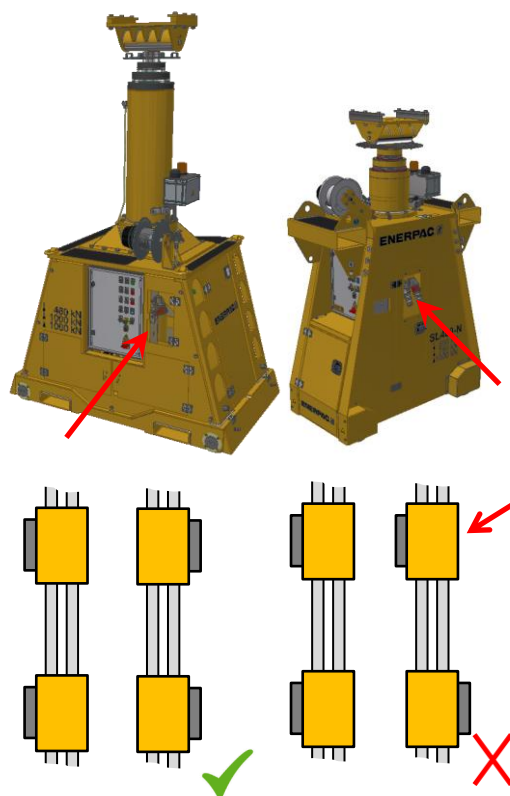
### 5.3.1 Put the unit on the skid tracks

To put the units upon the skid tracks, observe the following:

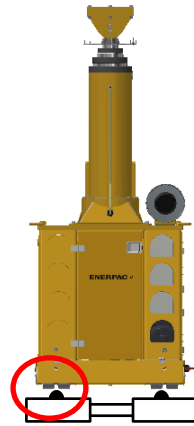
Observe the hoisting instructions as given in section 5.1.1 "Transporting a unit".



In order to avoid the necessity of being underneath the load in case of electrical problems, position the units in such a way that the power plugs and the local control panels are accessible from the outside.



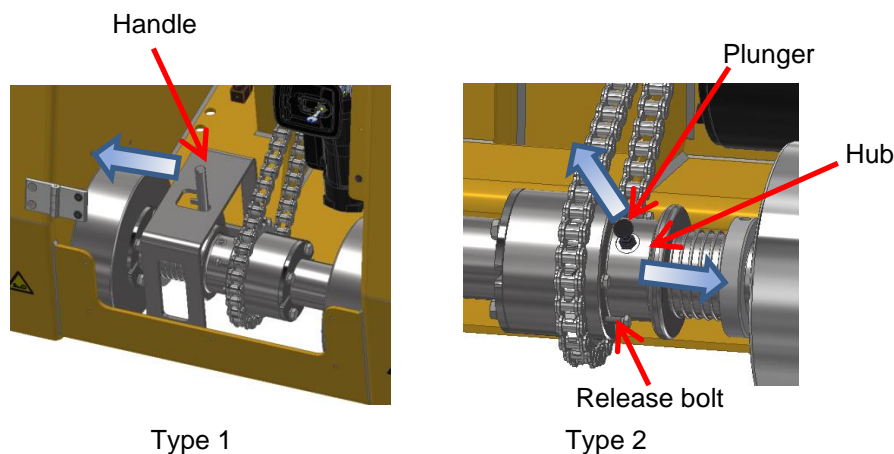
Make sure the grooves in the roller tracks match with the ridges on the skid tracks.



### 5.3.2 Move the unit towards its position

To move the unit along the skid tracks towards its position, you may use the freewheel mechanism. (The SL400 is not provided with the freewheel mechanism.)

There are two types of freewheel mechanisms. Type 1 is operated with a handle (left) and Type 2 is operated with a plunger (right).



Proceed as follows:

1. Make sure the cylinder is retracted fully.




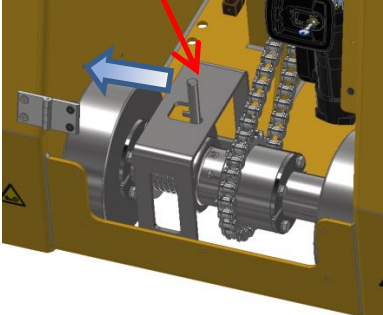
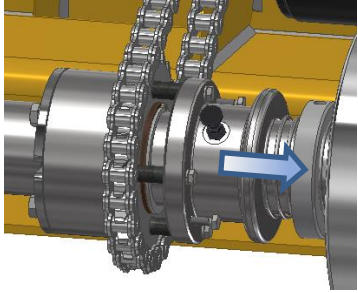

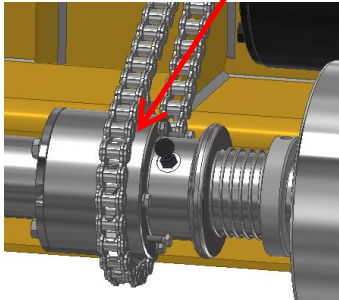
**Attention:** Only use the freewheel function if there is no load on the unit, and the cylinder is fully retracted.

2. Use a wedge to prevent the unit from rolling.




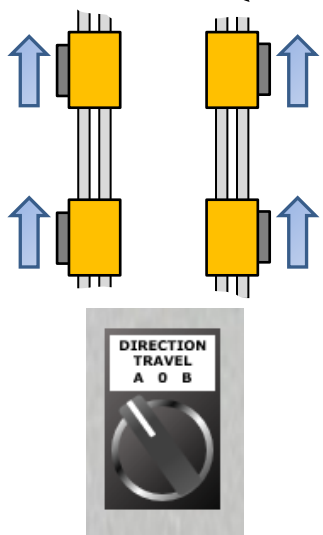

**Hazard:** The unit may start rolling when you uncouple the mechanism if it is not positioned level.



<p>3. Type 1: Pull the handle to the left. Then push it backwards and release it. <i>Now the unit is in freewheel position.</i></p> <p>Type 2: Pull the plunger and move the hub as indicated. If you cannot move the hub by hand easily, then</p> <ul style="list-style-type: none"> <li>• Tighten the two release bolts while pulling the plunger. <i>The hub shifts.</i></li> <li>• Turn the release bolts to their original positions.</li> </ul> <p> <b>Hazard:</b> work carefully in order to prevent fingers get stuck between the gearwheel and the chain.</p>	<p>Handle</p>  
<p>4. Type 2: Release the plunger and move the hub until the plunger locks in the freewheel position. The plunger is spring loaded. <i>The unit is now in freewheel mode.</i></p>	
<p>5. Push the unit along the skid track to the position where you want it.</p>	
<p>6.</p> <ul style="list-style-type: none"> <li>• Type 1: Pull the handle to the left. Then pull it forward and release it.</li> <li>• Type 2: Pull the plunger. <i>A spring pushes the hub against the gearwheel.</i></li> </ul>	
<p>7. Slowly travel the unit by its own motor. Use the travel buttons on the electrical cabinet in local control mode; see section 6.2 “The control panel of the unit”. <i>The pins of the hub get into the holes of the gearwheel.</i> <i>The plunger locks the hub in the coupled position.</i> <i>The driving mechanism is coupled.</i></p>	
<p>8. Verify that the driving mechanism is coupled well.</p> <p> <b>Attention:</b> No clearance between the hub and the shaft is allowed.</p>	<p>No clearance</p> 

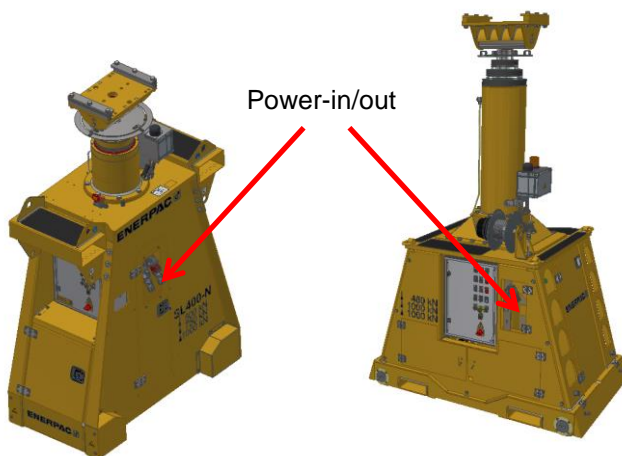
## 5.3.3 Set the travelling direction.

To set the travelling direction, proceed as follows:

<p>1. Set the travelling direction of all units in such a way that the units travel in equal directions. Use the switch on the control panel of the unit.</p> <p> <b>NB:</b> Usually, the two units on one skid track will be set to "A" and the two units on the other skid track to "B".</p>	
<p>2. Test the moving directions when the power has been connected; see section 5.4 "Connect the power cables".</p>	

## 5.4 Connect the power cables

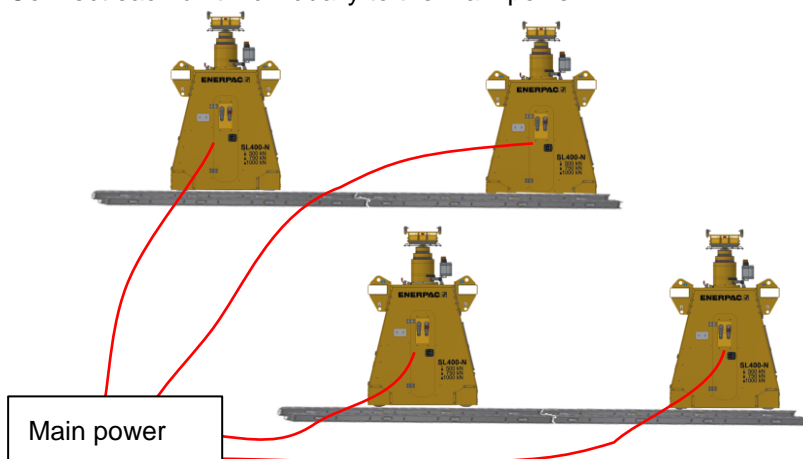
Connect the power cables to units. Use the sockets on the electrical cabinet or on the side of the machine. The male socket is the input and the female socket is the output.



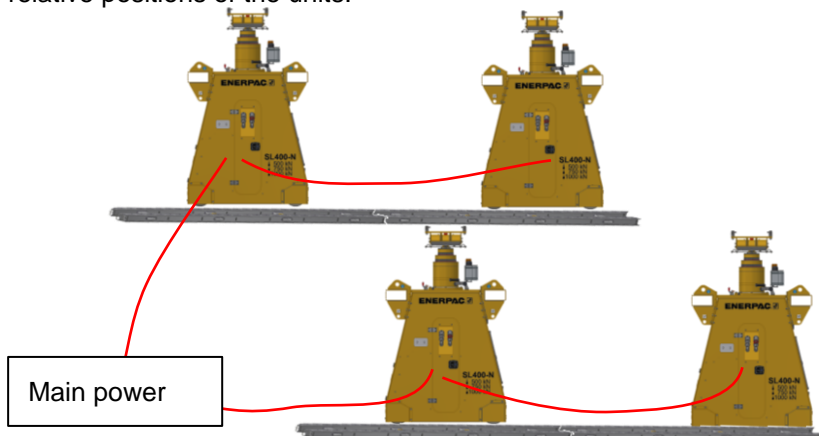
There are two options for connecting the units. Pick one, according to your own demands.



- Connect each unit individually to the main power.



- Connect the units two-by-two to the main power. This might save cable length, depending on the relative positions of the units.



**Attention:** Interconnecting more than two units may damage the system.

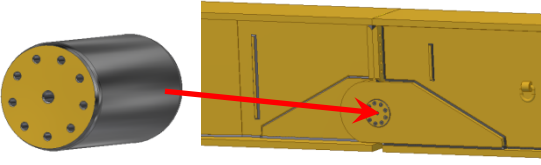
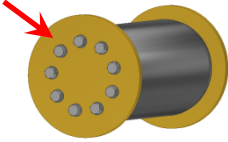
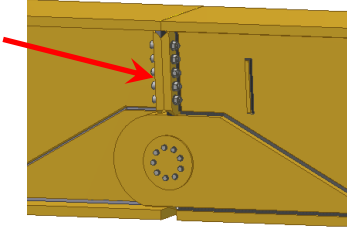
## 5.5 Mount the header beams

### 5.5.1 Assemble the modular beam

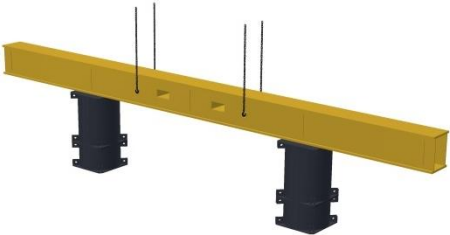
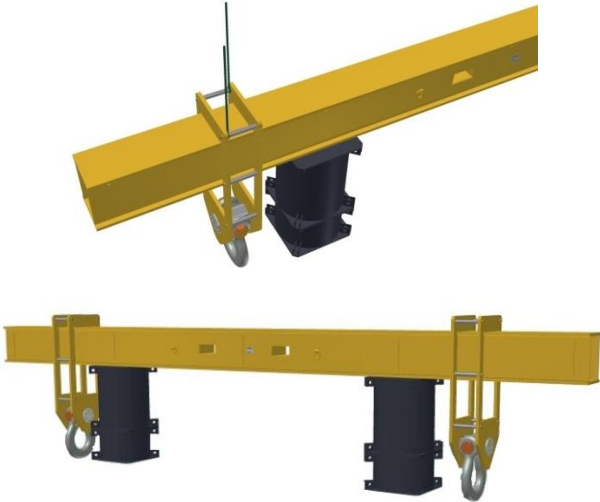
Modular beams are optional.

When you apply the modular header beam then assemble it as follows:

<ol style="list-style-type: none"> <li>1. Put two sections male / female together and align the holes</li> </ol>	<p>The diagram shows two yellow modular beam sections. Red arrows point to the circular holes on the ends of the beams, indicating where they should be aligned for assembly.</p>
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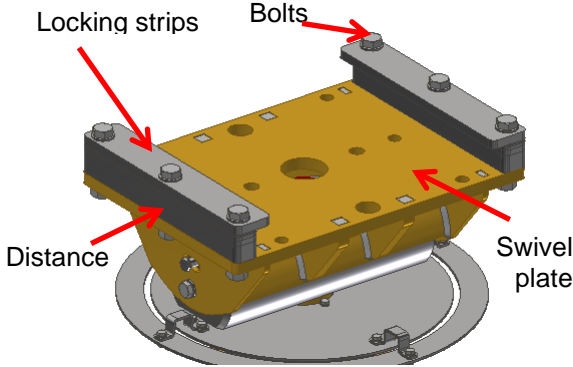
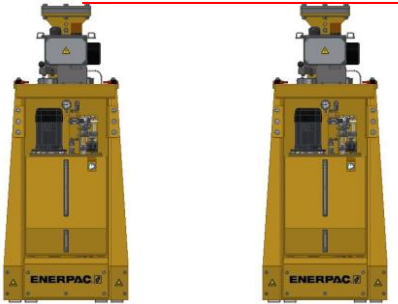
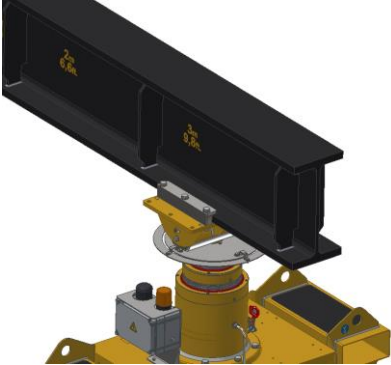
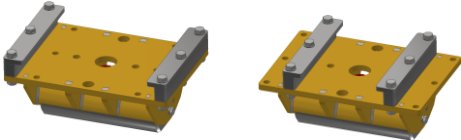
<p>2. Mount the connection bolt</p>	
<p>3. Mount the flanges of the connection bolt</p>	
<p>4. Tighten the bolts according to the table in Appendix G "Torque settings".</p>	

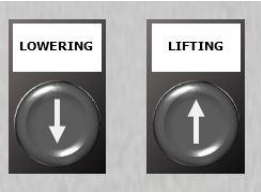

**5.5.2 Mount the lifting lugs**

<p>1. Lift the header beam on top of two supports.</p>	
<p>2. Put the lifting lugs over the header beam symmetrically.</p>	

## 5.5.3 Mount the header beam on top of the cylinders

To mount the Header Beams on top of the Units proceed as follows:

1.	Remove the six bolts at the top of the swivel plate	
2.	Remove the locking strips.	
3.	Make sure the swivels of two units are in line with a tolerance of 5 mm.	
4.	Put the header beam on top of both swivels.	
5.	Clamp the header beam to the swivel using the distance strips and the locking strips.  Note that two types of beams can be mounted: <ul style="list-style-type: none"> <li>• Wide (480 mm)</li> <li>• Narrow (300 mm)</li> </ul>	
6.	Set the locking strips of the swivel according to the applied type header beam.  Eventually use the thickness strips to compensate for plate thickness of the beam.	

7.	Level the beam. Use the buttons of the electrical cabinet.	
8.	Tighten the bolts hand tight.  <b>NB:</b> <ul style="list-style-type: none"> <li>• Make sure that all bolts are tightened properly.</li> <li>• Always apply all bolts.</li> </ul>	

## 5.5.4 Mount longitudinal beams


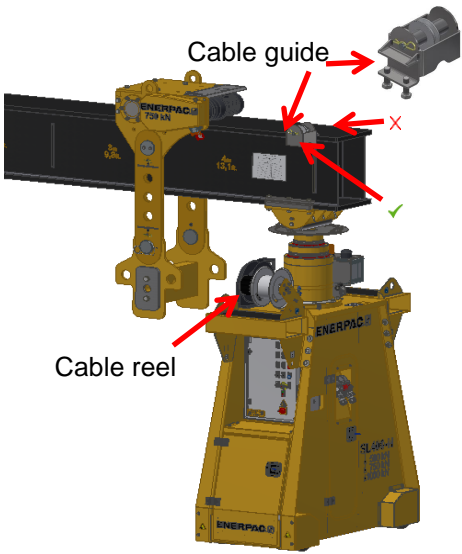
When you apply longitudinal beams (see section 3.4.1 “Header beam configurations”), make sure that those longitudinal beams are securely fastened to the header beams. Enerpac provides a solution for mounting the longitudinal beams. Contact Enerpac if you are going to use longitudinal beams.

## 5.6 Mount the side shifts on top of the header beams

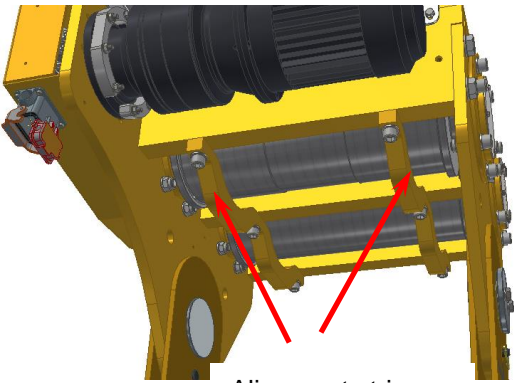

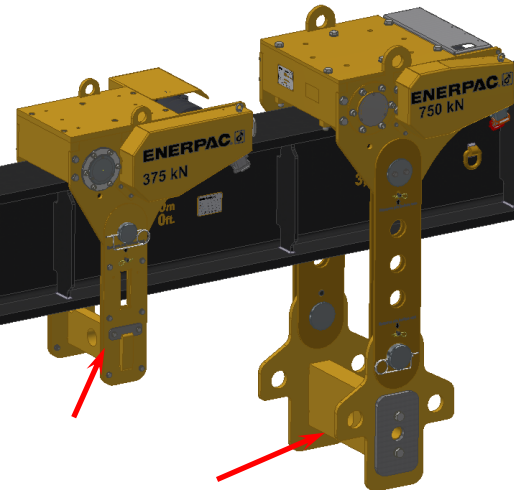
To mount the side shift units, perform the following steps:

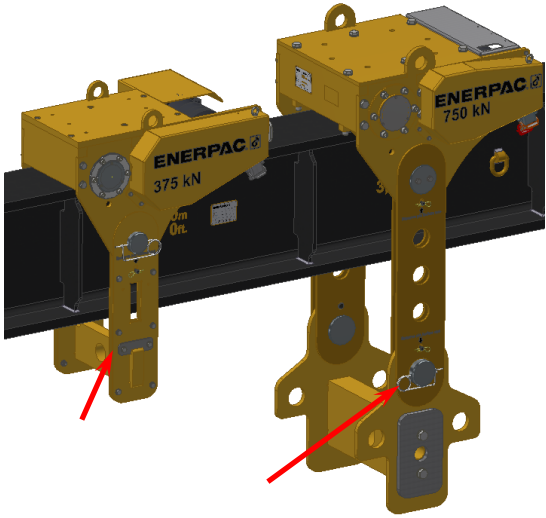
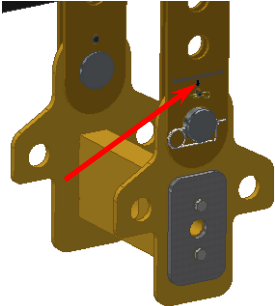
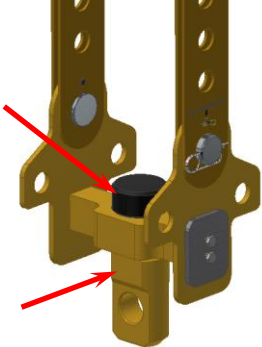
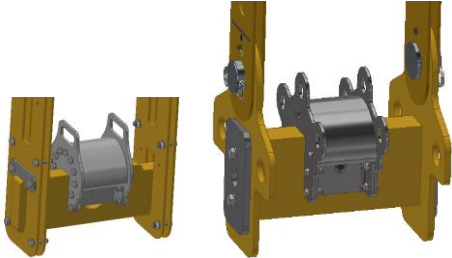
- Mount the cable guiding wheel.
- Mount the side shift unit.
- Connect the cable.

### 5.6.1 Mount the cable guiding wheel.

1.	Mount the cable-guiding wheel at the header beam at the side where the cable reel is mounted.   <b>Attention:</b> When mounting on the rear side, the cable may get pinched.	
2.	Mount the cable reel (option).	

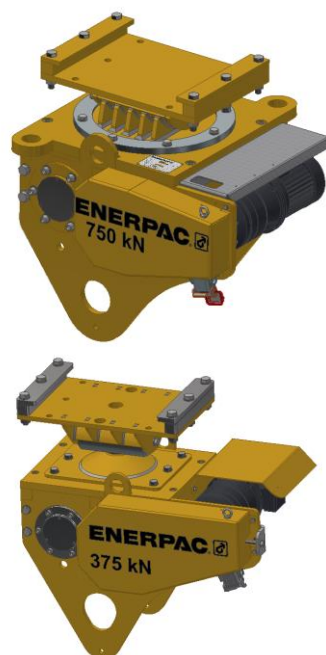
## 5.6.2 Mount the SSU150 and SSU300

<p>1. Hoist the side shift unit out of the transportation frame.</p>	<p>See section 5.1.4 “Hoisting a side shift unit”</p>
<p>2. If you apply the SSU300 together with the narrow header beam then mount alignment strips.</p>	 <p>Alignment strips</p>
<p>3. Put the side shift over the header beam.</p> <p><b>NB:</b> Preferably put the side shift units with their chain-boxes at the same side of the header beam. This makes setting of the running direction of the side shift units more logical.</p>	
<p>4. Place the anchor block</p>	

<p>5. Lock the anchor with the locking strips or locking pins.</p>	
<p>6. Remove the locking pins on both sides</p>	
<p>7. If you're going to apply a rotation anchor, then mount the rotation anchor</p>	
<p>8. If you're going to apply slings then mount the sling anchor.</p>	

9. If you're going to apply a top swivel kit then mount the kit.

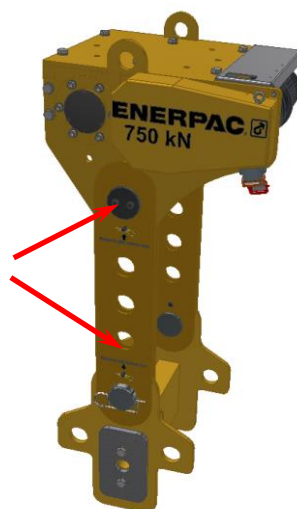
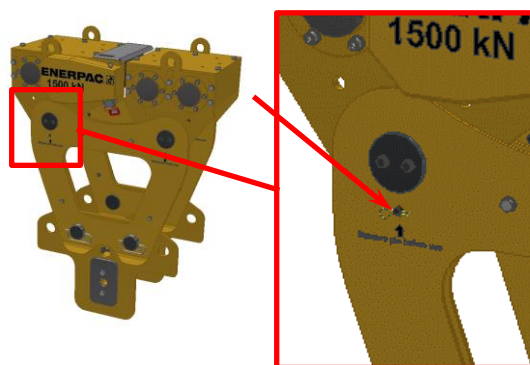
The top swivel kit can be mounted directly on top of the side shift unit



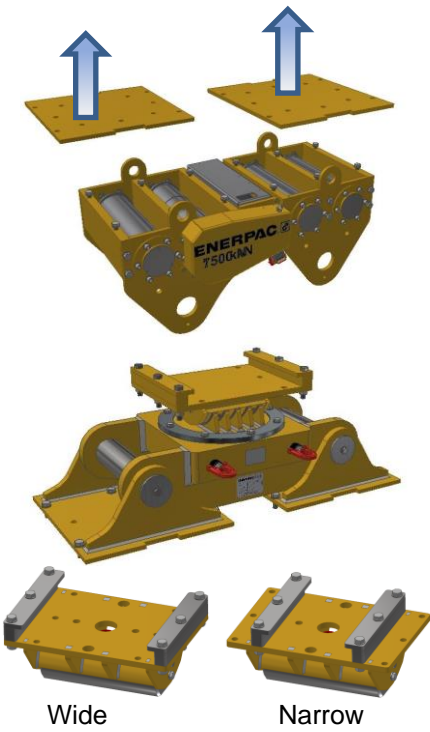
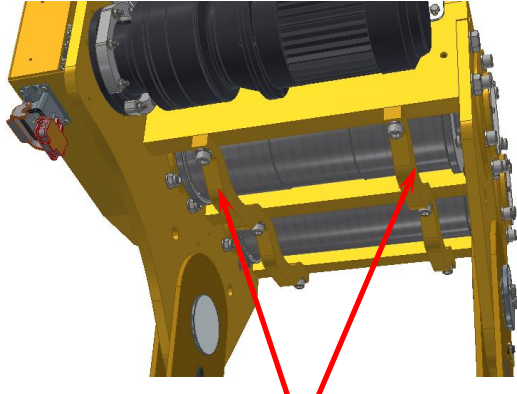
10 Remove pins before use. Otherwise the system cannot hinge around the anchor plate pins.



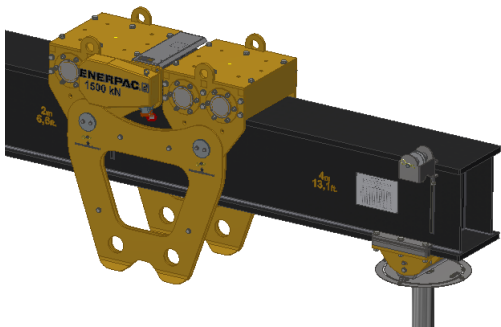
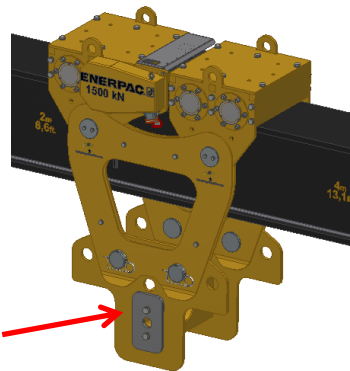
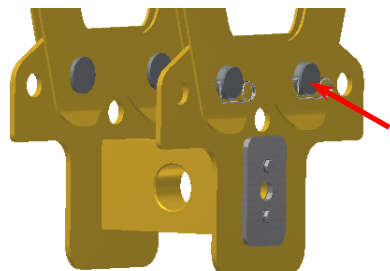
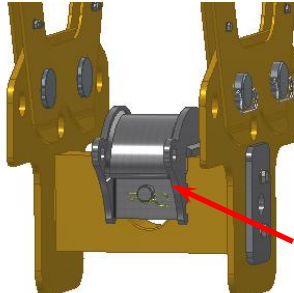
**Attention:** ensure that the cable is mounted in such a way that it cannot get pinched.



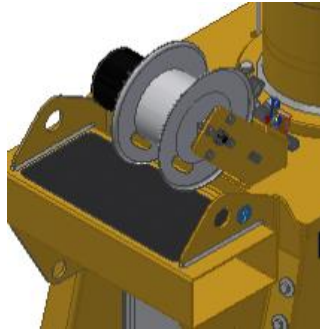

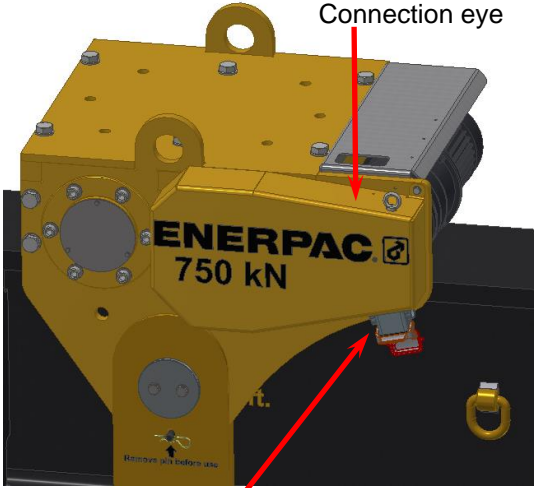
## 5.6.3 Mount the SSU300


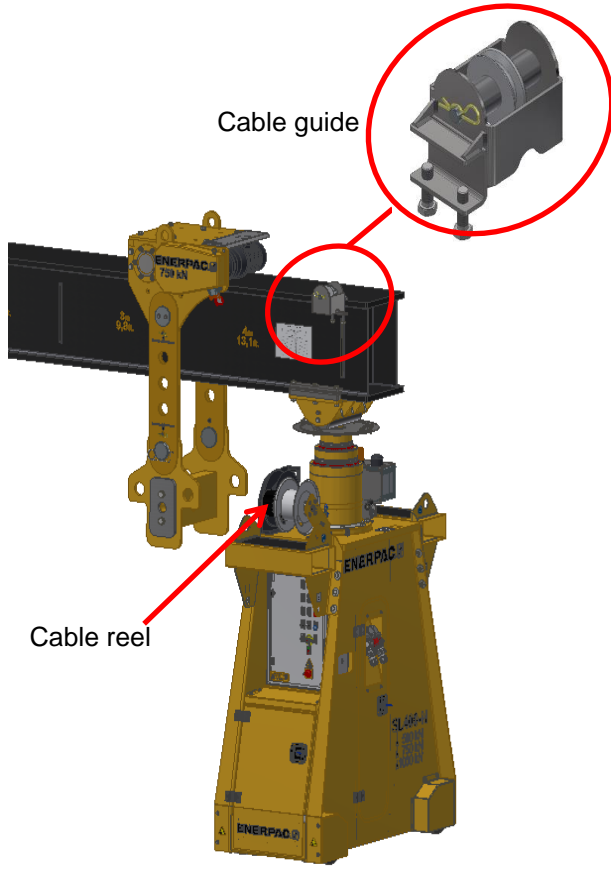
<p>1. If you want to apply the top swivel:</p> <ul style="list-style-type: none"> <li>• Unscrew the top plates from the side shift unit and remove the top plates.</li> <li>• Put the top swivel on top of the unit and fix the bolts. Use the lifting lugs of the top swivel to hoist.</li> <li>• Set the locking strips of the swivel according to the applied type header beam.</li> </ul>	
<p>2. Hoist the side shift unit out of the transportation frame.</p>	<p>See section 5.1.4 “Hoisting a side shift unit”</p>
<p>3. If you apply the narrow header beam then mount alignment strips.</p>	 <p>Alignment strips</p>





<p>4. Put the side shift on the header beam.</p> <p><b>NB:</b> Preferably put the side shift units with their chain-boxes at the same side of the header beam. This makes setting of the running direction of the side shift units more logical.</p>	
<p>5. Place the anchor block</p>	
<p>6. Lock the anchor with the locking pins</p>	
<p>7. If you're going to apply slings, then mount the sling tool. Lock with the pin.</p>	

### 5.6.4 Connect the cable of the side shift unit

<p>1. Connect the cable on the cable reel with the side shift.</p>	
<p>2. Connect the cable on the cable reel with the side shift.</p> <p>Connect the strain relief of the cable to the connection eye</p> <p> <b>Attention:</b> ensure that the cable is mounted in such a way that it cannot get pinched.</p>	 <p>Connection eye</p> <p>ENERPAC 750 kN</p> <p>Cable plug</p>


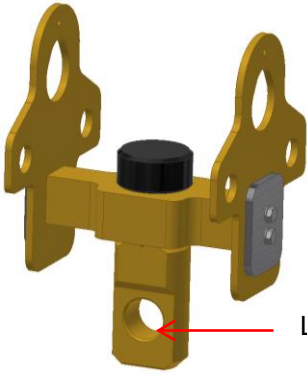
<p>3. Feed the cable it through the guiding guide. Use the provided strain relief.</p> <p> <b>Attention:</b> ensure that the cable is mounted in such a way that it cannot get pinched.</p>	 <p>Cable guide</p> <p>Cable reel</p>
--	--

## 5.6.5 Set the moving direction

<p>1. Set the moving direction in such a way that side shift units will move in the same direction. Use the control panel; see section 6.2 “The control panel of the unit”.</p>	
<p>2. Test the moving directions when the power has been connected.</p> <p> <b>Attention:</b> wrong setting of the moving direction may cause dangerous situations during lifting.</p>	

## 5.7 Install the rotation anchor

If you apply the rotation anchor, then proceed as follows:


1.	Use the locking pins and the safety clips to attach the rotation anchor to the side shift unit.	 <p>Locking pin and safety clip</p>
2.	Use the lifting hole to suspend the load to the rotation anchor.	 <p>Lifting hole</p>
3.	Install a drop zone. The drop zone had to be cordoned off with barriers, tapes etc. in such a way that no-one can enter the area. Also, the operators shall not enter the drop zone during the operation.	

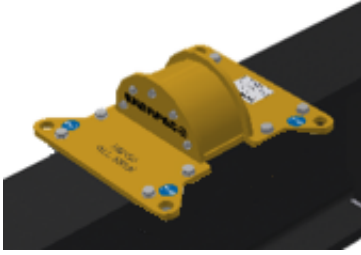

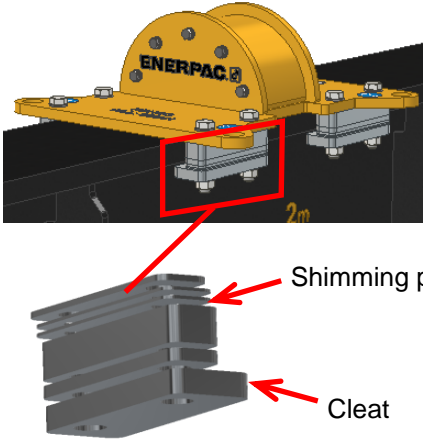
## 5.8 Install the sling guides



To install the sling guides, proceed as follows.

**Hazard:** fingers and hands can be crushed between sling guide and header beam.

1.	Remove the cleats and shimming plates from the sling guide.	
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2.	Position the sling guide on top of the header beam.	
3.	<p>Lock the sling guide to the header beam with bolts. Use shimming plates according to the thickness of the flange of the headerbeam.</p> <p> <b>Caution:</b> If the sling guides are not well locked to the header beam, they may move, causing misalignment of the load.</p>	 <p>Shimming plates</p> <p>Cleat</p>

## 5.9 Install the remote-control console

The remote-control console can communicate with the units:

- Wireless, using radio connection.  
No cables have to be used on the working area, but the radio communication can be disturbed.
- Wired, using data cables.  
Preferable when the radio link is disturbed.
- Hybrid communication: some units are controlled by wire, other units wireless.

### 5.9.1 Wireless communication

The communication operates on a radio frequency of 2.4 GHz.

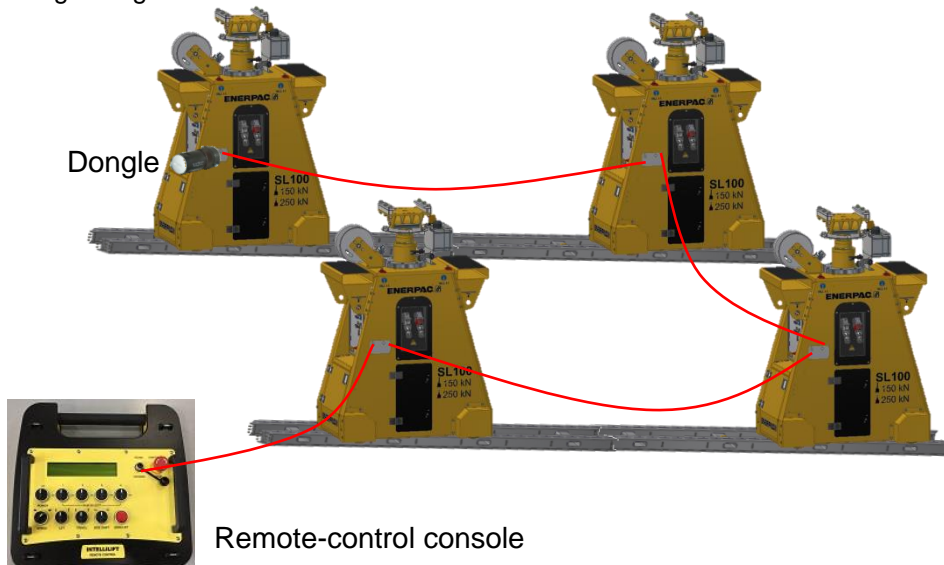
If connection may be disturbed by radio reflections or 'dead' areas. Walking to another position may help.

If the connection fails:

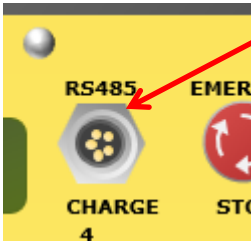


- A report is given on the LCD of the remote-control: "\*\*\*\* Communication-time-out \*\*\*\*"
- If the communication fails for 2 seconds, then all movements of the units and the side shifts are stopped.
- If the communication fails for 10 seconds, then the system makes an Emergency stop.  
For recovering from this situation reference is made to section 6.1. "The Emergency buttons".

## 5.9.2 Wired communication

To enable wired communication between the remote-control console and the four units, set up the following configuration:

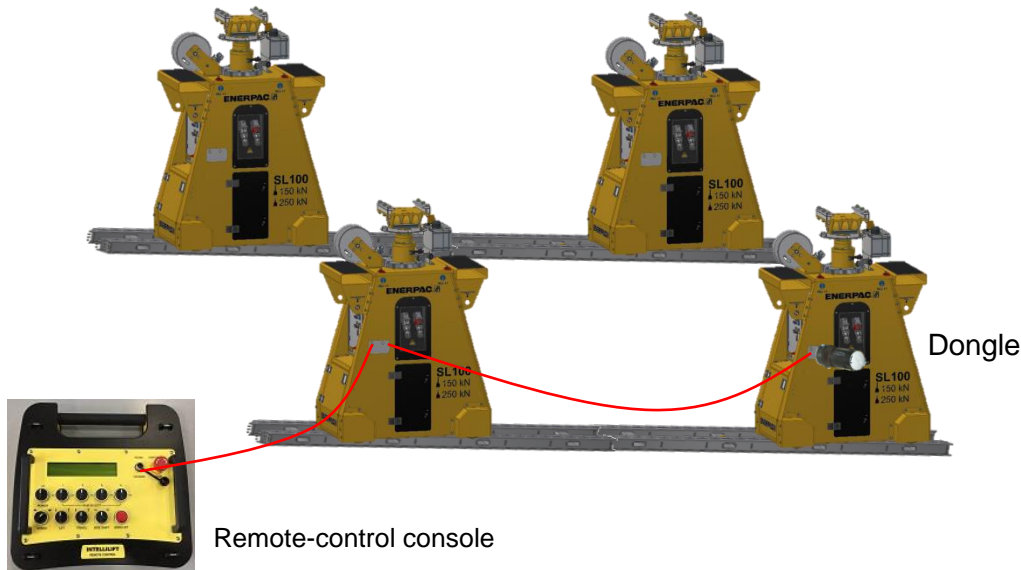


Proceed as follows.

1.	Make sure the remote-control console is switched off	
2.	Make sure the power of all units is switched off	
3.	Connect the data cable to the RS-485 socket of the remote-control console.	
4.	Connect the data cable to one of the units. Each unit is provided with two RS485 sockets. Use one of them; the sockets are functionally identical.	
5.	Connect another data cable to the other socket of the unit and connect it to the next unit.	
6.	Carry on connecting until all units are connected. The sequence in which you interconnect the units does not matter since the units will identify themselves automatically.	
7.	Provide the unused socket of the last connected unit with the dongle.	

## 5.9.3 Set up mixed wireless and wired communication

Some units are controlled by wire, while other unit(s) are controlled wireless. An example of a possible configuration is shown below.



Follow the procedures 5.9.1 “Wireless communication” and 5.9.2 “Wired communication”.




**NB:** During operation you can change a unit from wireless to wired communication and vice versa, just by connecting and disconnecting the cable. The system will automatically set up the connection. Don't forget to mount the dongle for wired connection.


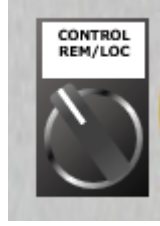


## 5.9.4 Set up the communication for wireless and for wired connection

To set up the communication between the remote-control console and the four units to work, proceed as follows.


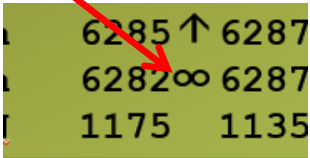
Reference is made to

- the controls on the remote-control console.  
The layout of the remote-control console is given in section 6.3 “The remote-control console”.
- the controls and indicators of the units.  
The layout of the control panel is given in section 6.2 “The control panel of the unit”.

1.	Connect data cables for the units you want to control by wire. The system will automatically detect their presence.	
2.	Ensure that the “Emergency stop” button on the remote-control console is in the non-activated position.	

<p>3. Switch the main power switches on the control panels of all units to "on".</p> <p><i>The "power on" indicator on the control panel of the Units will be lit.</i></p>	
<p>4. Switch the unit to Remote</p>	
<p>5. Verify that the blue indicator is off. It is switched off as soon as the communication with the unit is established.</p> <p>Make sure that the "Emergency stop" buttons on all units' are in the non-activated position.</p>	
<p>6. Select the units you want to control. The remote-control console can now detect the units. <i>If the connection with a unit is fine than the "emergency active" indicator on the control panel of that unit is off.</i></p>	
<p>7. Set the same switches to off again</p>	



<p>8. Switch the remote-control console off and then to on.</p> <p><i>As soon as the communication is established:</i></p> <ul style="list-style-type: none"> <li>• the text “Engine still” is displayed</li> <li>• an ‘infinite’ symbol is displayed in case of wired communication</li> </ul> <p><i>If the remote-control console detects data cables, then the wireless means are switched to off.</i></p> <p><i>Now it is possible to control the units.</i></p>	 
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## 5.9.5 Pairing the remote control with the units




Only when the remote-control console or one of the units was replaced, pairing is required.


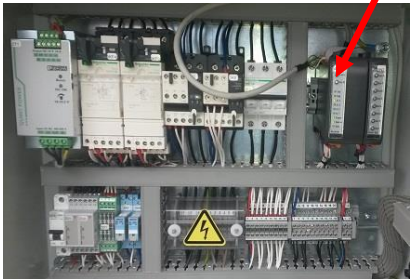


Each remote-control console is provided with a unique code. This code is known by the receivers of the units, so they can recognize their Master’s Voice.



**NB:** Enerpac has set this communication configuration initially. The setting is persistent and remains after switching off the power.

The pairing procedure has to be performed for each unit individually. Proceed as follows:

1.	Make sure the battery of the remote-control console is charged	
2.	Switch the units off.	
3.	Deselect all units.	
4.	Switch the unit which has to be paired on.	

5.	Select the concerned unit	
6.	Open the electro cabinet of the unit, where you find the Intelli receiver module.	
7.	<p>Press "LEARN" for two seconds</p> <p><i>When the text "NO ANSWER" disappears from the display of the remote-control console, the remote-control console and the unit are connected.</i></p>	
8.	Eventually repeat [2] .. [8] for the other units	
9.	Verify that the number on the remote-control console match with the numbers on the units, by travelling with the units individually.	

## 5.9.6 Perform an all-over visual inspection of the System

Inspect the system visually.

Enter the result of the inspection in the checklist given in Appendix B "Checklist for installing the System".

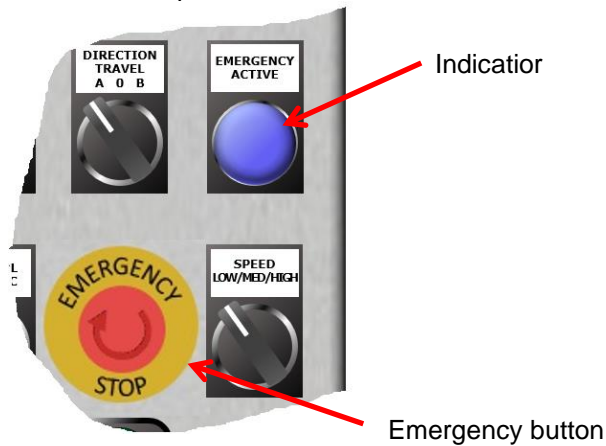
## 6 How to control the system

### 6.1 The use of the emergency buttons

The system is provided with emergency buttons. Press an emergency button when you want to stop all movements of the system immediately.

Available emergency buttons:

- on the control panels of all four units.



When the emergency button is pressed:

- The unit is switched off.
- The blue button “Emergency active” is on.
- If the unit is in remote-control, then other units in remote control are switched off as well.

To recover the system from an Emergency situation:

- Investigate why the button was pressed.
- Turn and pull the emergency button.
- Press the blue buttons on all units individually.

- The remote-control device is provided with an emergency button.



When the button is pressed, all units which are in remote-control are switched off and all movements stop.

To recover the system from an Emergency situation:

- Investigate why the button was pressed
- Press the blue buttons on all units individually
- Restart the system

## 6.2 The control panel of the unit

The control panel of each unit is provided with controls and indicators. Using the controls, the unit can be operated. Other units cannot be controlled. This mode is called 'local control', and intended to be used for maintenance and setup purposes.

You use local control:

- To manoeuvre the units into position. Use the control panel on the unit.
- To manoeuvre the side shifts into position. Use the control panel on the unit to move the side shifts.
- To synchronise the moving directions of the units. Use the control panel on the unit.
- To synchronise the moving directions of the side shifts. Use the control panel on the unit.

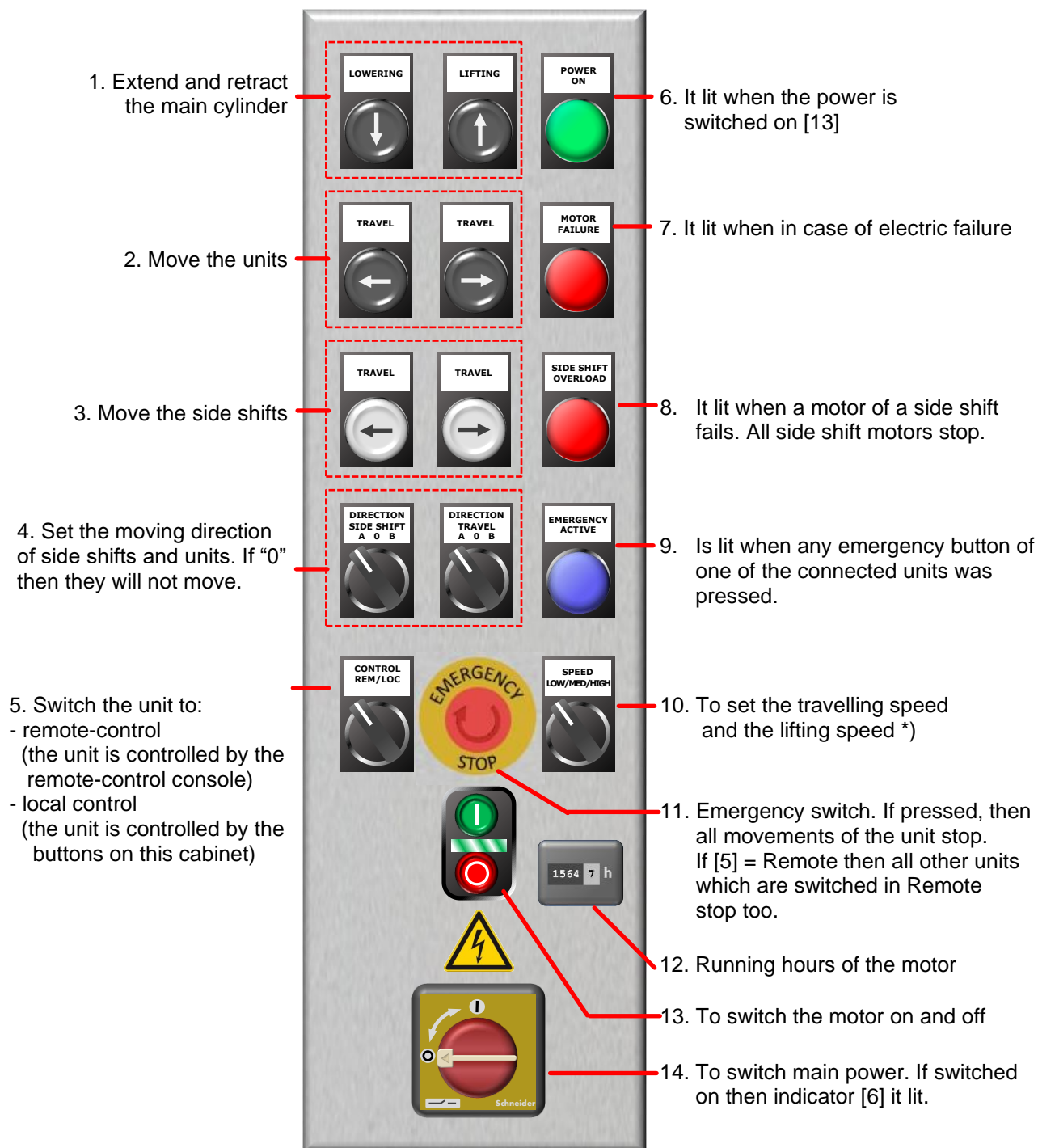


**Attention:** Do never use the travel, lifting and lowering function in local control when the header beams are mounted, since:

- the units are not controlled simultaneously.
- no automatic levelling is performed
- no load detection is performed.



**Hazard:** Usage of local control when there is load on the system may cause instability of the system.



\*) ad 10:

The button is only effective when the unit is in local control.

When a load is detected of when the cylinders are extended in more than one stage, the speed is set to low automatically.

## 6.3 The remote-control console

The remote-control console enables the operator

- to execute a lifting operation on a safe distance
- to control all units simultaneously

This mode is called "Remote-control".

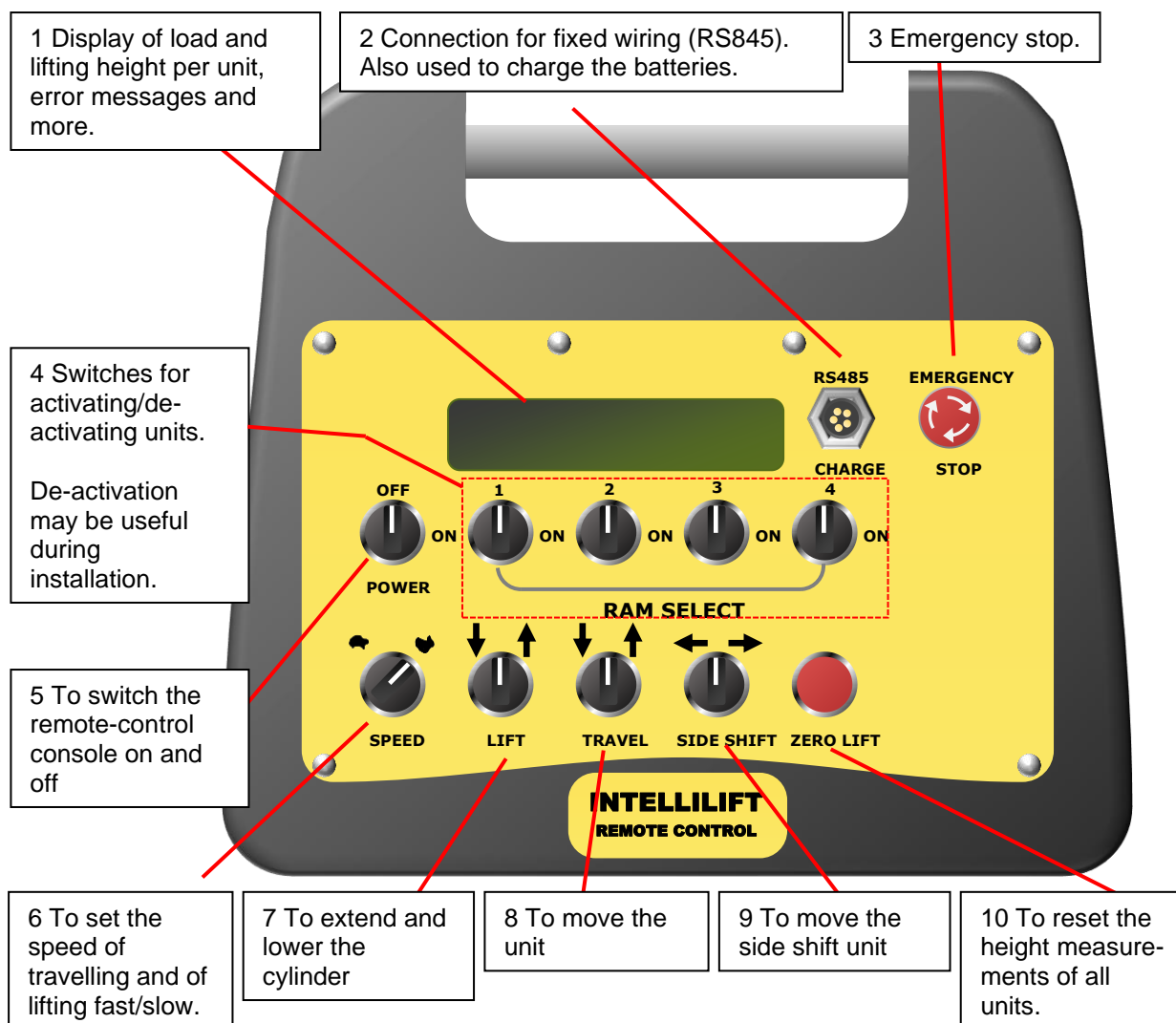
Applying the remote-control console ensures that

- the moving speeds of the units is synchronized
- the heights of the booms are kept equal within a tolerance of 24 mm.



**NB:** System start up is faster when the remote-control console is switched on before the units are switched on.

### 6.3.1 The controls



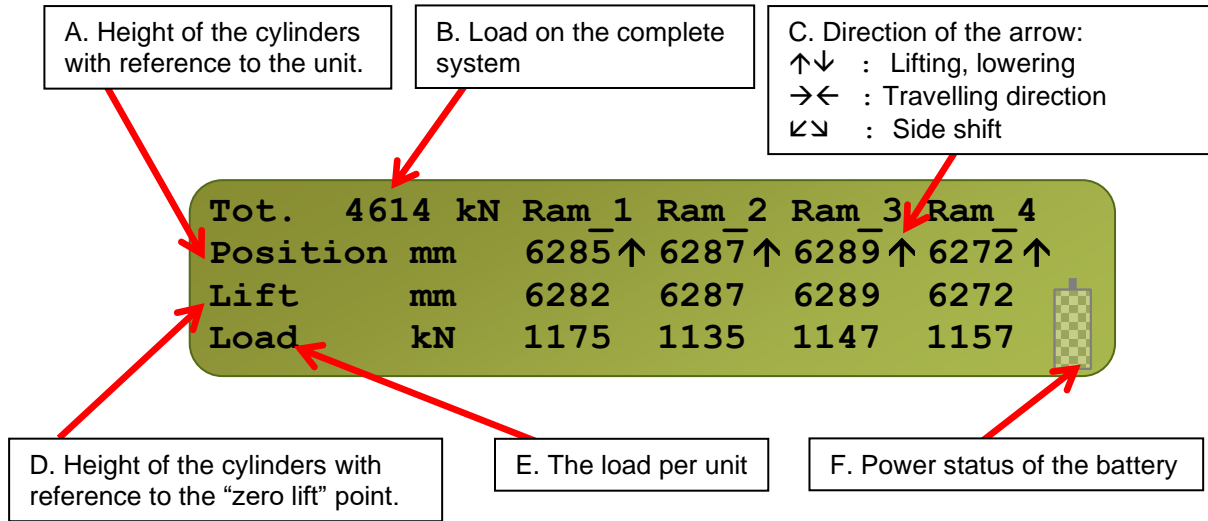
\*) ad 6:

The system will only move fast if the load on all units <10% of max load, and no cylinders are extended in stage 2. Otherwise the system automatically operates in 'Slow' mode.

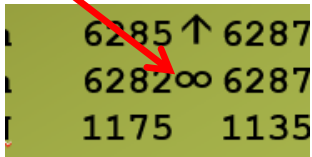

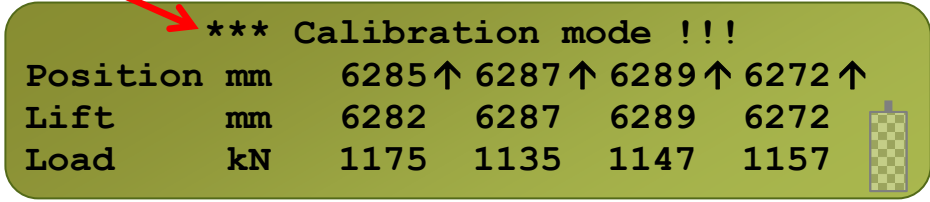
\*) ad 9: **Caution:** Side shift is a separate system. Side shifting is not stopped when overload in one of the units occurs.

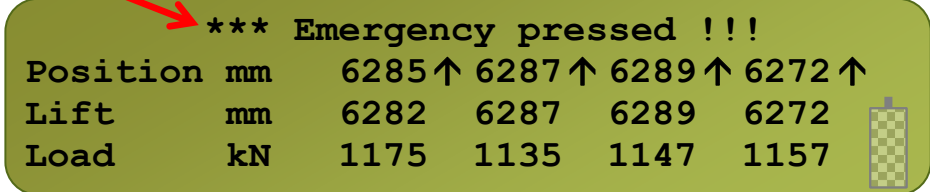



**6.3.2 The display**



The following information is visible on the screen:

Tot.	The total load on the selected units.
Position	The height of the selected cylinders with reference to the unit itself.
Lift	The height of the selected cylinders with reference to the point where the "zero lift" button was pressed. When wired communication with the Units is OK, a "∞" symbol is shown behind the Lift value. 
Load per unit	The load of the selected cylinders,  <b>NB:</b> The load is a calculated value, based on the height. So, changes in the indicated position may cause a jump in the load indication. The values indicated for the non-selected cylinders are invalid
Warnings and errors	Warnings and errors are shown in the top line.  A list of possible errors and warnings is given in section 8.2 "List of problems and solutions".

Emergency pressed	 <p>The report "****Emergency pressed****" is shown:</p> <ul style="list-style-type: none"> <li>• When the emergency button on the remote-control console was pressed</li> <li>• When the emergency button on a unit was pressed, but only when that unit was on Remote-control. See section 6.1 "The use of the emergency buttons".</li> </ul>
Power status of the battery	<p>The display shows the power level of the battery. The console can operate approximately 8 hours on a fully charged battery. Switch the console off after use and connect it with the 12V loader.</p> <p> <b>NB:</b> Only apply the delivered loader.</p>

## 6.4 Rotate the load using the rotation anchor



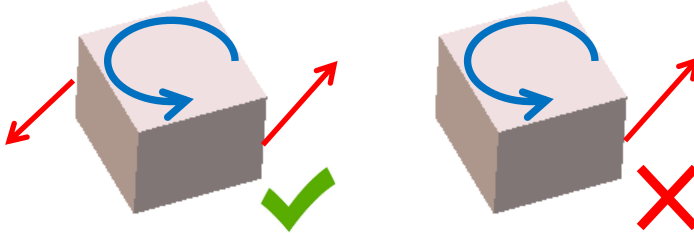
**Attention:** Rotating the load is a potentially dangerous operation, due to the fact that the load is suspended to one single point.



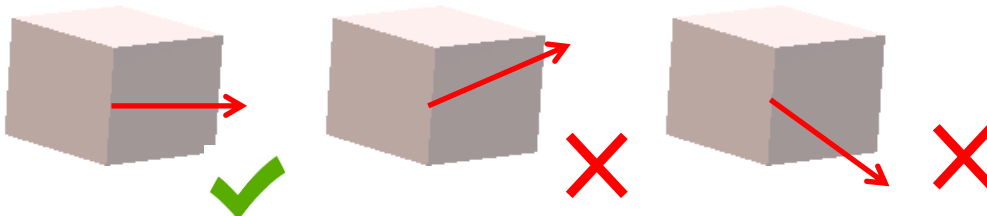
**Hazard:** Not following the rules given in this section may cause damage to the lifting system and to the load.

Observe the following rules:

- Always rotate load slowly.
- Use guide wires for rotating.
- The guide wires shall be used all the time while the load is lifted, in order to keep the load in correct position.
- Apply symmetrical forces to the load by the guiding wires:

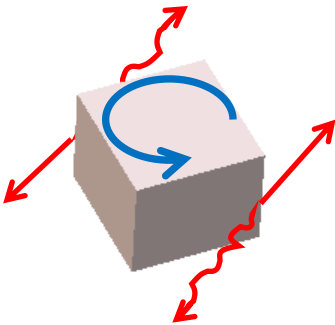


- Always pull in the horizontal plane

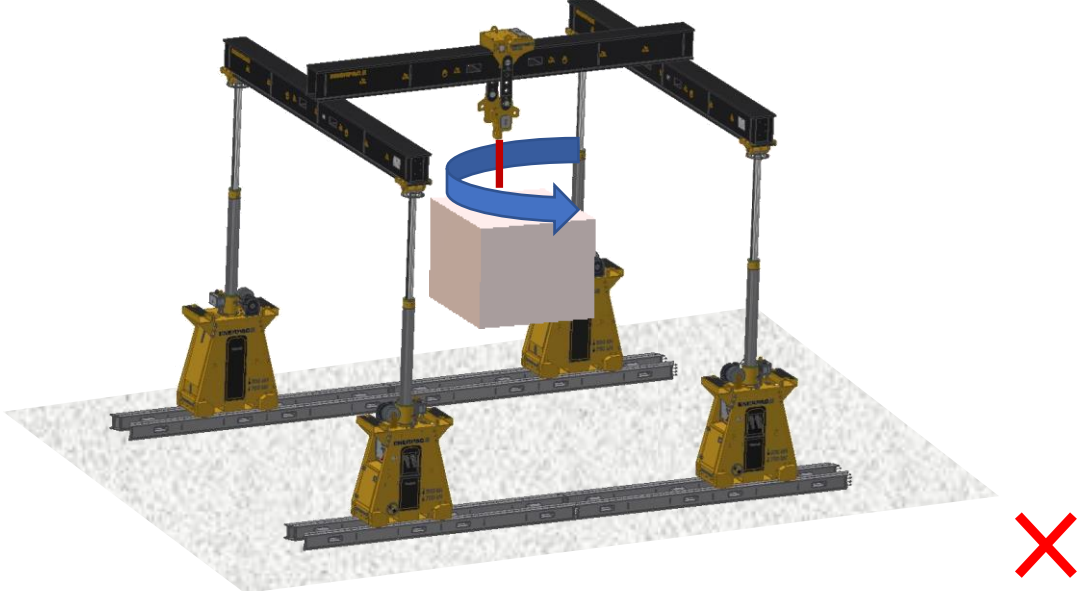
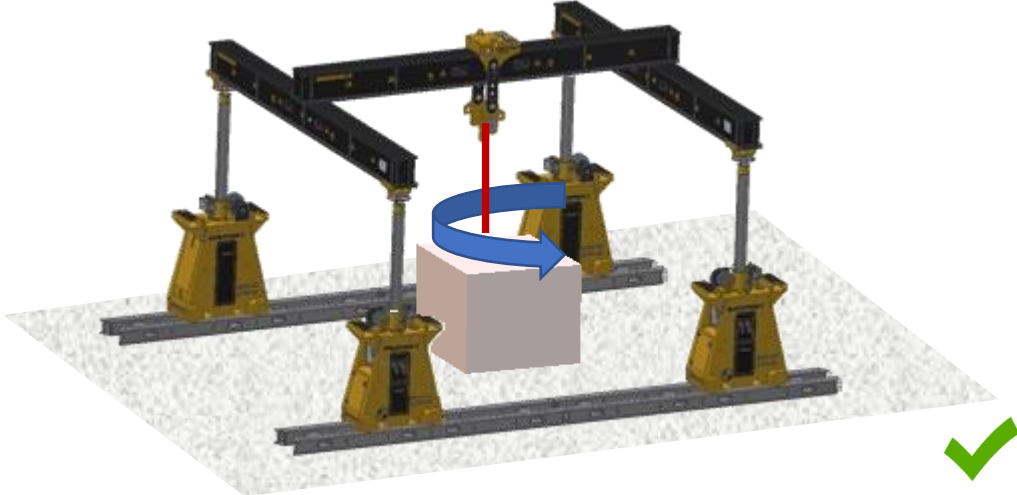


- Have guide wires in place to stop the load from moving. Those guide wires have to be symmetrically attached to the load as well. The guide wires have to be manned during the operation.

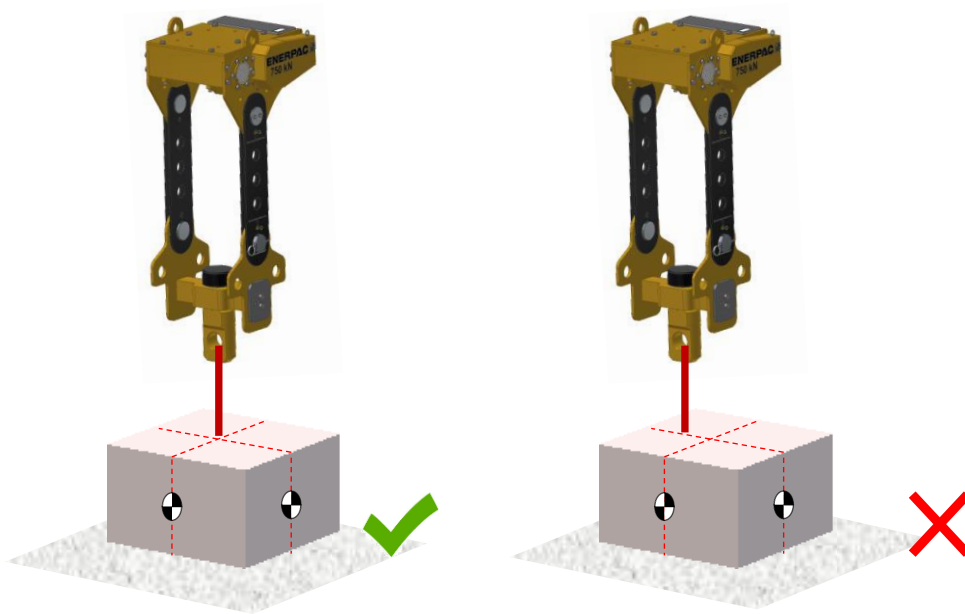




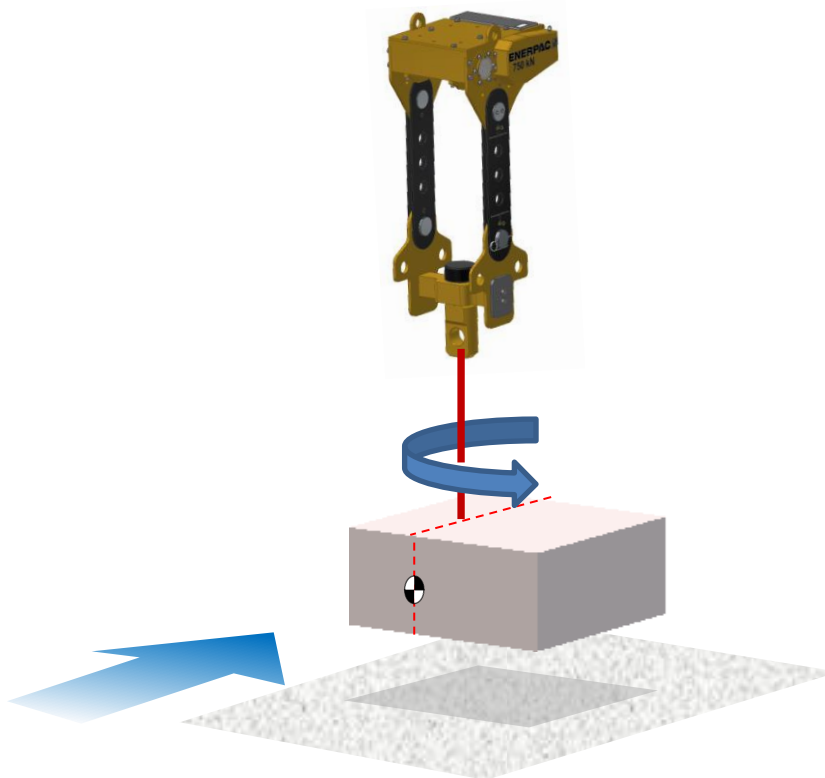
- Preferably put the load in low position while it is rotated.



- Make sure the centre of gravity of the load is perpendicular underneath the lifting hole of the rotation anchor, in order to prevent swinging of the load while it comes free from the ground.



- Be aware that wind may rotate the load if the centre of gravity of the load is not at the same position as its geometrical centre.



## 6.5 Limiting devices

- When the system is in remote-control, it will stop moving when the difference of height of the cylinders exceeds 24 mm.
- When the system is in remote-control, it will stop moving when the difference of travelled distance of the units exceeds 24 mm.
- In local control the cylinder can only be extended if there is no load on the system.

## 7 Execute an operation

This section describes how to perform a lifting operation.

Precondition is, that the system has been set to work completely, and that you are familiar with the operation if the system.



**NB:** Operation of the system is only allowed for personnel certified by Enerpac as authorised operator.

### 7.1 Main directions

#### 7.1.1 Risks and Warnings

Proper handling of the System is essential for safety.

Observe the System while operating.

Make sure the working area is fenced off.

Address the following subjects:



#### Hazard

- **Improper use** of the machine may result in accidents causing damage not only to the machine itself, but also to objects and goods in its vicinity or mounted to the machine, as well as injuries to people in the immediate area, and possibly even death.
- Failure to adhere to the **checklists** may result in serious injury to the user, possibly even death.
- Even if all safety measures are taken and the system is operated correctly, there will remain a **residual risk** of falling of the system.



#### Caution

- Failure to **prepare correctly** for a lifting operation may result in total loss of machine stability during use.
- When lifting, always assume a **worst-case scenario**. The wind can be unpredictable, quickly changing speed and direction. Do not take any chances: if the wind is strong, that means it's a 'no go'!
- Never attempt to extend or retract masts to which something is attached or which are fitted with a buffer beam. The extension cylinders are not designed to bear additional weight.
- Do not operate the system when a **person is close** to it.



#### Attention

- It is of the utmost importance to **read this manual** carefully before setting up the machine. Failure to prepare correctly for a lifting operation may result in total loss of machine stability during use.
- Adhere to the **checklists** during all work activities: during preparation for the lifting operation, system construction, and for lifting the load.
- Local control is only permitted if there is a beam attached to the unit.
- A unit is only part of the central emergency stop system if the control selector switch is in the remote position.
- Ensure that the load avoids contact with a gantry leg or any obstructions while lifting, side shifting, or traveling.
- Ensure that the gantry legs, header beams, and other components of the gantry system avoid contact with any obstructions while traveling.
- Ensure that the load avoids contact with any obstructions while lifting.
- The operator should have an unobstructed view of the system and load during operation of the system. If this is not possible, a signalperson shall be used with an effective means of communication to provide directions to the operator.
- Communication among personnel involved in the operation shall be maintained continuously during all movement of the load. If at any time communication is disrupted, the operator shall stop all movements until communication is restored.
- Signals to the operator should be in accordance with the standards prescribed in section 1.9 "Hand signals". If special signals are required, they shall be agreed upon by the operator and support

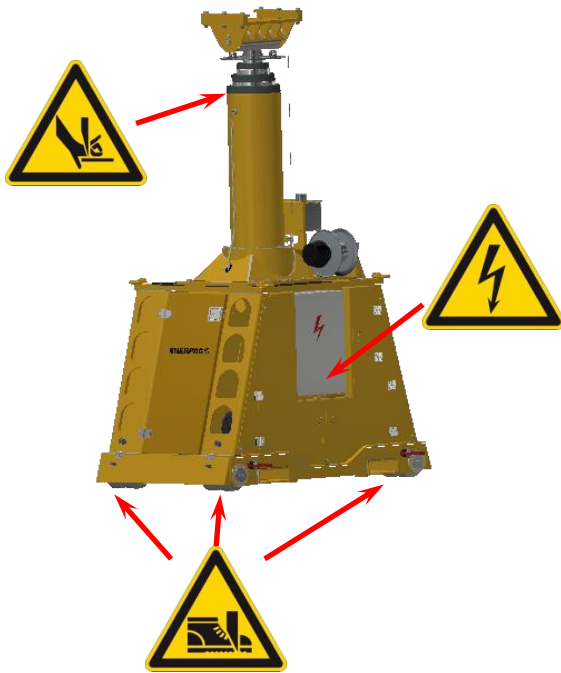
personnel prior to the lifting operation. Signals shall always be visible or audible. No action shall be taken unless signs are clearly understood.

- Load handling personnel shall obey any stop signal.



**NB:** Pay attention to the “Hydraulic fluid safety information” as listed in Appendix F “Hydraulic fluid safety information”.

## 7.1.2 Warning signs on the System



**NB:** Follow the instructions on labels applied to the system, without question.

The legend of the symbols is given in section 2.3 “Symbols applied to the System”.

## 7.2 Local control of one unit

This section describes how to control one single unit.




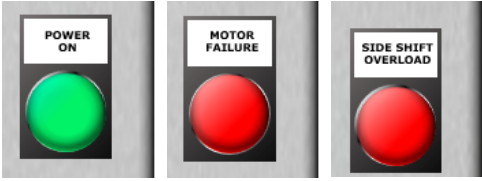


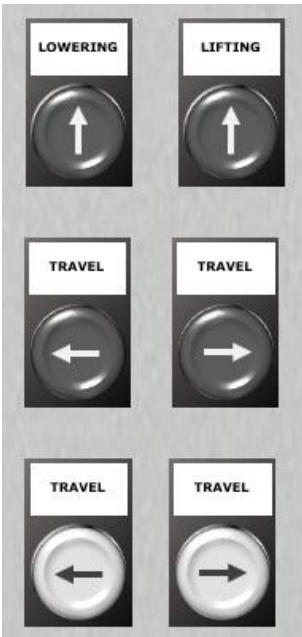
**Attention:** Never use local control when header beams are mounted, since:

- the units are not controlled simultaneously.
- no automatic levelling is performed
- no load detection is performed.
- Local control may only be used for maintenance and set-up purposes. Never use local control to lift a load.

For the buttons, switches and indicators reference is made to 6.2 “The control panel of the unit”.

To use local control proceed as follows:

1.	Switch the unit on. Switch the motor on.	
----	---	---

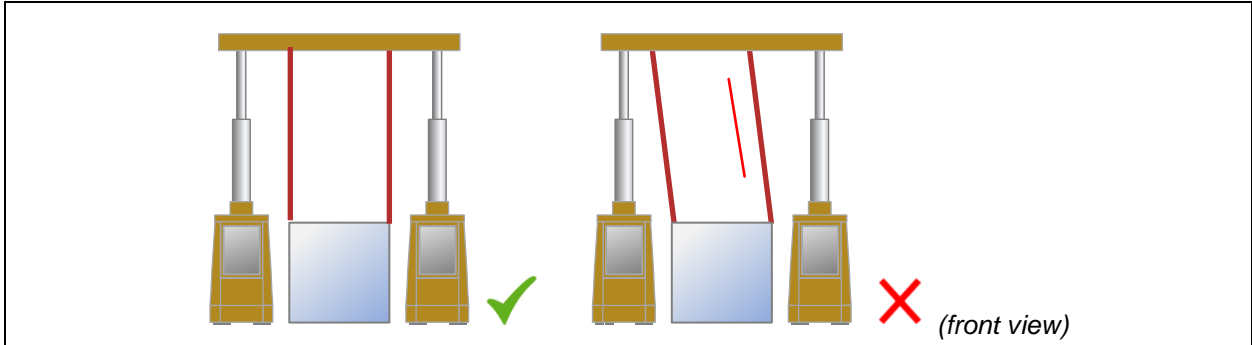
2.	<p>Verify that power on is lit, and motor failure and side shift overload are off.</p>	
3.	<p>Set the unit to Local Control</p>	
4.	<p>Select the required speed</p>	
5.	<p>Perform the operation you want to:</p> <ul style="list-style-type: none"> <li>• Extend or retract the cylinder</li>   <li>• Move the unit</li>   <li>• Move the side shifts</li> </ul>	

## 7.3 Suspend the load

### 7.3.1 Side shift or lifting lugs



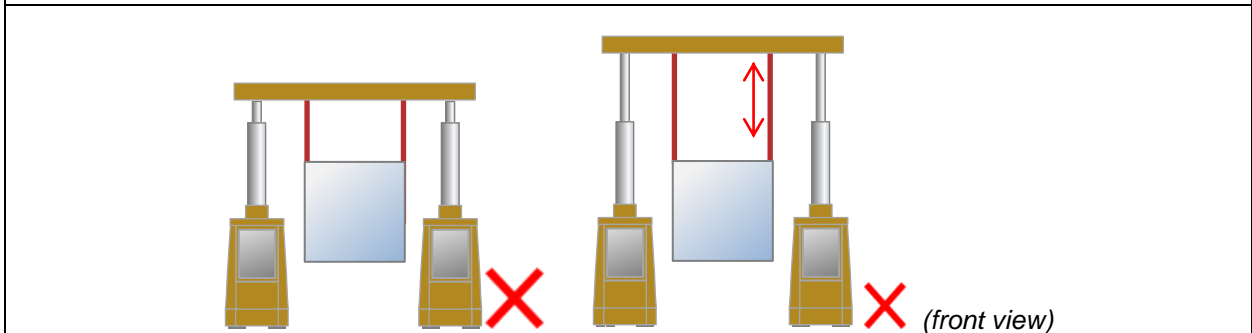
To suspend the load, use side shift or lifting lugs.  
**Attention:** Do not place the sling directly over the header beam.



The anchors on the header beam have to be in line with the hoisting points of the load.



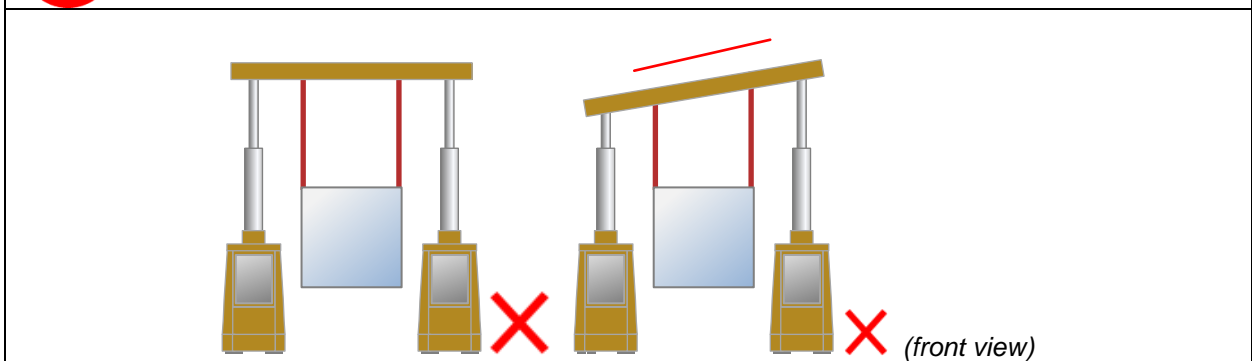
**Hazard:** if the anchors are not in line with the hoisting points, the load will sway as soon as it gets free from the ground. The resulting lateral force may endanger the stability of the System.



Keep the lifting straps as short as possible.



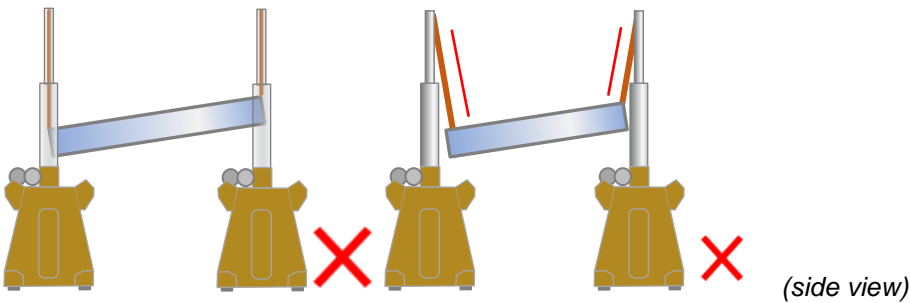
**Hazard:** long slings may enable swinging of the load, causing dangerous lateral forces.



The header beam has to be kept level at any time, with a tolerance of 0.2°.


Level the header beam at installation time.

During operation the header beam is kept level automatically.




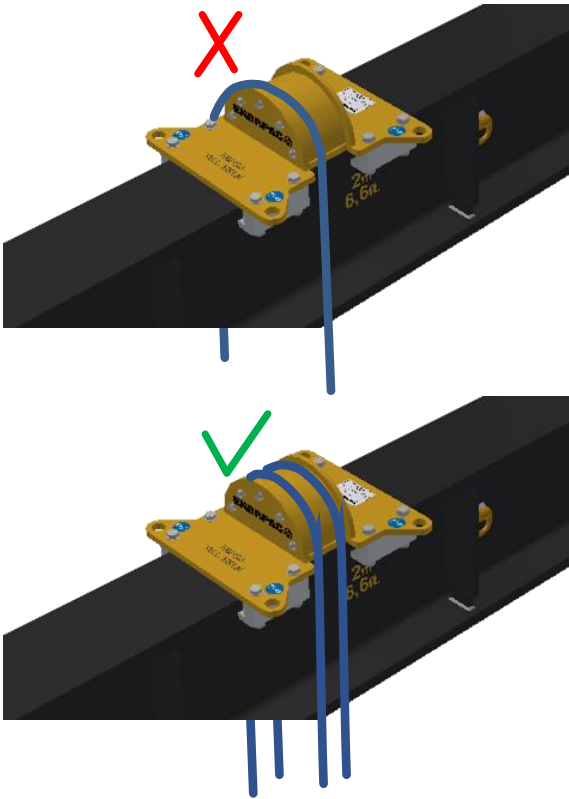
(side view)

Lifting slings have to be plumb within a tolerance of 0.2°. This is especially applicable for tilting operations; see section 7.9 “Tilt the load”.

 **Hazard:** exceeding the limit of 0.2° will cause dangerous lateral forces.

## 7.3.2 Sling guides

To suspend the load using sling guides, proceed as follows:

<p>1. Position the slings over the sling guides. Make sure the slings are in parallel. Make sure the slings do not run over the flanges of the sling guide.</p> <p> <b>Hazard:</b> If the slings are incorrect placed, they might fall from the sling guide, injuring the operator.</p>	
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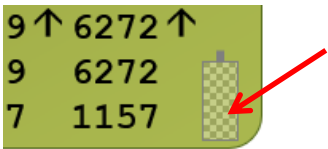

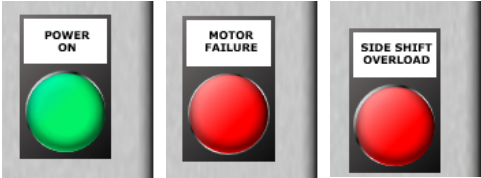

## 7.4 Lift the load

This section describes how to lift the load.

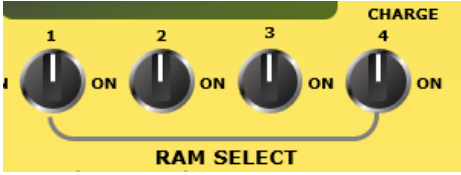




In the procedure below reference is made to

- the controls on the remote-control console; see section 6.3 “The remote-control console”.
- the controls and indicators of the units; see section 6.2 “The control panel of the unit”.

Proceed as follows:

1.	Record all activities during the operation using the form given in Appendix D “Recording a lifting operation”	
2.	Verify that the checklists given in: <ul style="list-style-type: none"> <li>• Appendix A “Checklist for planning”</li> <li>• Appendix B “Checklist for installing the System”</li> </ul>	
3.	Switch the remote-control console on. <i>The remote-control console starts up.</i> <i>The software version number is displayed</i>	
4.	Verify the battery of the remote-control console is fully charged <i>The battery status is shown at the display.</i> <i>A full battery has a capacity of approximately 8 hours.</i>	
5.	Switch all four units on. Switch all motors on.	
6.	Verify that Power on is lit, and motor failure and side shift overload are off.	
7.	Set all units to Remote-control	


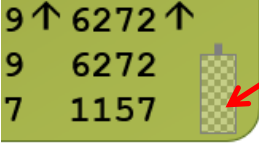










8.	<p>Activate all four units on the remote-control console.</p>																									
9.	<p>Reset the measured heights of all units by pressing “zero lift”.</p> <p><i>The current heights of the cylinders will be taken as the new reference points.</i></p> <p><i>The height counters on the display will start counting from zero.</i></p>																									
10.	<p>Select the travelling speed of your choice. Select “low” if the system is carrying a load.</p> <p><i>If the system detects a load, or if the units are extended for more than the first stage then “Low” is selected automatically.</i></p>																									
11.	<p>Lift the load using the remote-control console.</p>																									
12.	<p>While lifting, monitor the display (shown below).</p> <ul style="list-style-type: none"> <li>• Monitor the lifting heights. The heights of the cylinders are measured continuously. The remote-control console automatically levels the heights of the four cylinders within a bandwidth of 24 mm. <ul style="list-style-type: none"> <li>○ <i>When the height of one cylinder differs more than 12 mm from the others, its lifting speed (or the lifting speeds of the other beams) is slowed down until all heights are within a bandwidth of 6 mm.</i></li> <li>○ <i>When the difference of height exceeds 24 mm then system stops moving the load. Technical investigations of the problem have to be made. Follow the main problem-solving procedure as described in 8.1“Main problem localization procedure”.</i></li> </ul> </li> <li>• Monitor the individual loads on the units.</li> <li>• Monitor the total load on the system.</li> <li>• Monitor the direction of vertical movement.</li> <li>• Monitor the power status of the battery.</li> </ul> <div data-bbox="264 1778 1193 1973" style="background-color: #c8e6c9; padding: 10px; border-radius: 10px;"> <table border="1"> <thead> <tr> <th>Tot.</th> <th>4614 kN</th> <th>Ram_1</th> <th>Ram_2</th> <th>Ram_3</th> <th>Ram_4</th> </tr> </thead> <tbody> <tr> <td>Position mm</td> <td></td> <td>6285 ↑</td> <td>6287 ↑</td> <td>6289 ↑</td> <td>6272 ↑</td> </tr> <tr> <td>Lift mm</td> <td></td> <td>6282</td> <td>6287</td> <td>6289</td> <td>6272</td> </tr> <tr> <td>Load kN</td> <td></td> <td>1175</td> <td>1135</td> <td>1147</td> <td>1157</td> </tr> </tbody> </table>  </div>		Tot.	4614 kN	Ram_1	Ram_2	Ram_3	Ram_4	Position mm		6285 ↑	6287 ↑	6289 ↑	6272 ↑	Lift mm		6282	6287	6289	6272	Load kN		1175	1135	1147	1157
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13.	<p>Switch the unit off</p>																									
14.	<p>Switch the remote-control console off</p>																									

## 7.5 Move the load in longitudinal direction

To move the load, all units travel synchronously.  
The remote-control console is to be used.

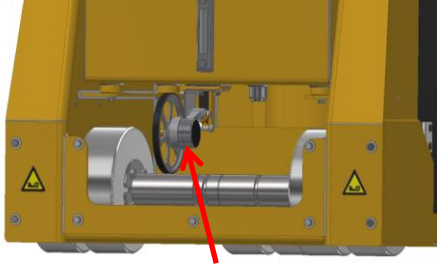
Proceed as follows:

1.	Record all activities during the operation using the form given in Appendix D “Recording a lifting operation”.	
2.	Verify that the checklists given in: <ul style="list-style-type: none"> <li>• Appendix A “Checklist for planning” and</li> <li>• Appendix B “Checklist for installing the System”.</li> </ul> are completed and signed off.	
3.	Switch the remote-control console on. <i>The remote-control console starts up.</i> <i>The software version number is displayed</i>	
4.	Verify the battery of the remote-control console is fully charged <i>The battery status is shown at the display.</i> <i>A full battery has a capacity of approximately 8 hours.</i>	
5.	Switch all four Units on.	
6.	Verify that Power on is lit, and motor failure and side shift overload are off.	
7.	Set all units to Remote-control	

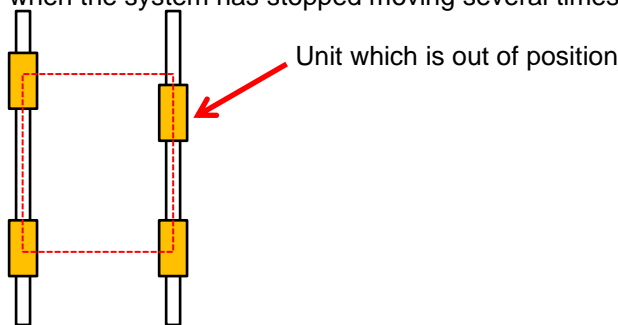
8.	<p>Activate all four units on the remote-control console.</p>																									
9.	<p>Select the travelling speed of your choice. Select "low" if the system is carrying a load.</p> <p><i>If the system detects a load, or if the units are extended for more than the first stage then "Low" is selected automatically.</i></p>																									
10.	<p>Move the units into the direction according to your own requirements.</p> <div style="display: flex; align-items: center;">  <p><b>Attention:</b> When you have stopped the system four times then you have to synchronize the positions of the units. See section 7.6 "Synchronize the positions of the units"</p> </div>																									
11.	<p>While travelling, monitor the display (shown below).</p> <ul style="list-style-type: none"> <li>Monitor the lifting heights.</li> </ul> <div style="background-color: #d4d4d4; padding: 10px; border-radius: 10px; margin: 10px 0;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Tot.</th> <th style="text-align: left;">4614 kN</th> <th style="text-align: left;">Ram_1</th> <th style="text-align: left;">Ram_2</th> <th style="text-align: left;">Ram_3</th> <th style="text-align: left;">Ram_4</th> </tr> </thead> <tbody> <tr> <td>Position</td> <td>mm</td> <td>6285 ↑</td> <td>6287 ↑</td> <td>6289 ↑</td> <td>6272 ↑</td> </tr> <tr> <td>Lift</td> <td>mm</td> <td>6282</td> <td>6287</td> <td>6289</td> <td>6272</td> </tr> <tr> <td>Load</td> <td>kN</td> <td>1175</td> <td>1135</td> <td>1147</td> <td>1157</td> </tr> </tbody> </table>  </div>		Tot.	4614 kN	Ram_1	Ram_2	Ram_3	Ram_4	Position	mm	6285 ↑	6287 ↑	6289 ↑	6272 ↑	Lift	mm	6282	6287	6289	6272	Load	kN	1175	1135	1147	1157
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Load	kN	1175	1135	1147	1157																					
12.	<p>Switch the unit off</p>																									
13.	<p>Switch the remote-control console off</p>																									

## 7.6 Synchronize the positions of the units


While the units travel, their relative positions are kept constant automatically by regulating their individual travelling speeds. Use is made of a sensor which measures the travelling movements of the unit.



The sensor starts measuring from zero every start. Therefore, a unit may get out of rectangular position when the system has stopped moving several times. Such is illustrated below.




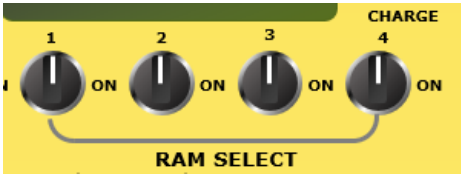



To synchronise the positions of the units, proceed as follows:

<p>1.</p>	<p>Measure the relative positions of the units.</p> <p>The units are in rectangular formation if</p> <ul style="list-style-type: none"> <li>• <math>B1 = B2</math></li> <li>• <math>A1 = A2</math>.</li> </ul> <p>To measure the positions of the units you might apply</p> <ul style="list-style-type: none"> <li>• a tape-measure</li> <li>• optical measuring means, if you want to stay away from the System while it is bearing a load</li> </ul> <p>Feel free to apply your own measuring methods.</p>	
<p>2.</p>	<p>If you detect misalignment then move the concerned unit (or units) to restore the rectangular formation. Apply the remote-control to move the unit.</p> <p> <b>Attention:</b></p> <p>To prevent worsening the situation:</p> <ul style="list-style-type: none"> <li>• Make sure you move the correct Unit(s) make sure you move it in the correct direction. The stability of the system is at stake!</li> <li>• Do not use local control to move the unit.</li> <li>• In order to keep a safe distance from the system.</li> </ul>	

## 7.7 Move the load in transversal direction

For moving the load in transversal direction, the moving capability of the side shift is applied. To operate the side shifts simultaneously, proceed as follows:

1.	Record all activities during the operation using the form given in Appendix D “Recording a lifting operation”.	
2.	Verify that the checklists given in: <ul style="list-style-type: none"> <li>Appendix A “Checklist for planning” and</li> <li>Appendix B “Checklist for installing the System”</li> </ul> are completed and signed off.	
3.	Switch the remote-control console on. The remote-control console starts up. <i>The software version number is displayed</i>	
4.	Verify the battery of the remote-control console is fully charged <i>The battery status is shown at the display.</i> <i>A full battery has a capacity of approximately 8 hours.</i>	
5.	Switch all four Units on. Switch all motors on.	
6.	Verify that Power on it lit, and Motor failure and Side shift overload are off.	
7.	Set all units to Remote-control	
8.	Activate all four units on the remote-control console.	

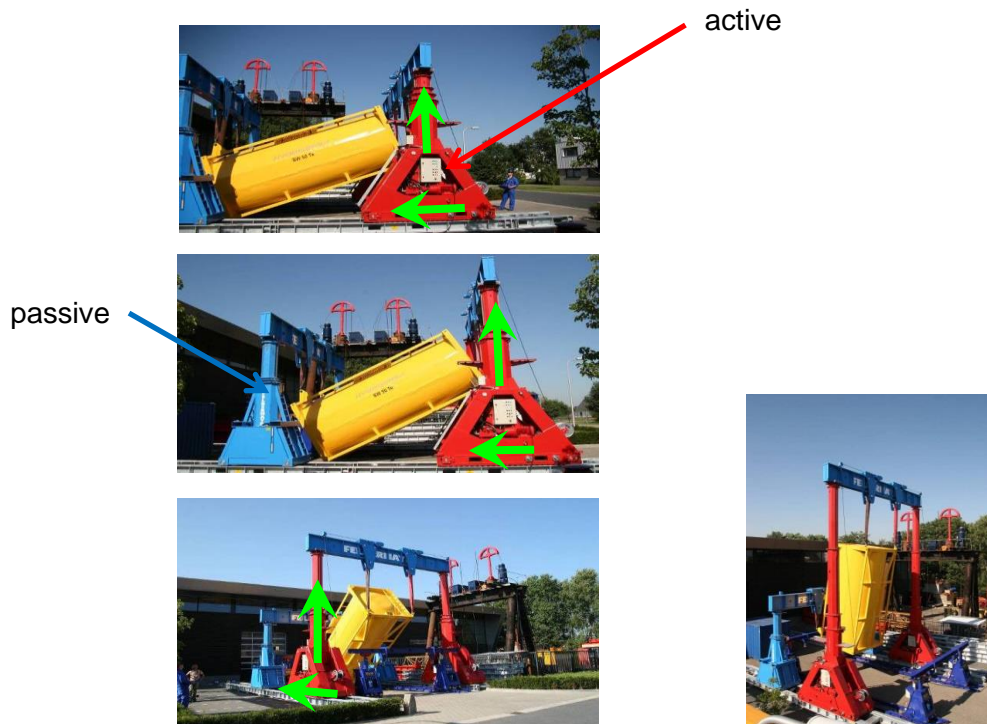
9.	Move the selected side shift units.	
10.	Switch the unit off	
11.	Switch the remote-control console off	

## 7.8 Rotate the load

1.	Be sure all personnel is outside the declared safety zone.	
2.	Lift the load using the gantry system.	
3.	Make sure stop-guide wires are in place and manned.	
4.	Rotate the load by pulling the guide wires.	See section 6.4 "Rotate the load using the rotation anchor".

## 7.9 Tilt the load

Tilting a load is illustrated below.



Observe the following:

- Unlike the normal lifting operations, here the slings should be kept as long as possible, to minimize lateral forces.
- Always apply four units.
- Only move two units at a time. Keep the other two units passive.  
In the illustration above the red unit is the active one: it moves towards the blue unit. The blue unit is passive and stands still.




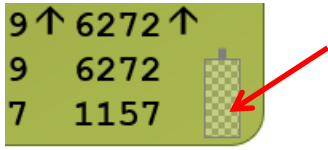

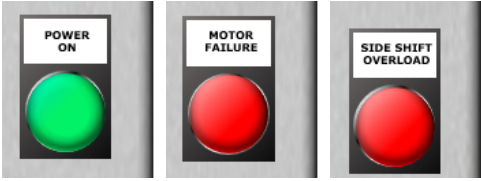

**Hazard:** This operation has an increased risk of dangerous lateral forces.

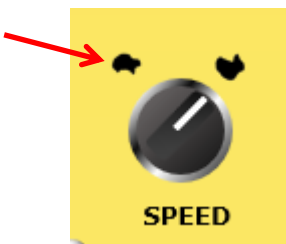



**NB:** If you want to perform a tilting operation, first contact Enerpac.

An illustrative video of a tilting operation is available on

<https://www.youtube.com/watch?v=rC1toW6ECfU>

To tilt a load, proceed as follows:

1.	Record all activities during the operation using the form given in Appendix □D “Recording a lifting operation”.	
2.	Verify that the checklists given in: <ul style="list-style-type: none"> <li>• Appendix A “Checklist for planning” and</li> <li>• Appendix B “Checklist for installing the System”.</li> </ul> are completed and signed off.	
3.	Switch the remote-control console on. <i>The remote-control console starts up.</i> <i>The software version number is displayed</i>	
4.	Verify the battery of the remote-control console is fully charged <i>The battery status is shown at the display.</i> <i>A full battery has a capacity of approximately 8 hours.</i>	
5.	Switch the two active Units on. Switch the motors on.	
6.	Verify that Power on is lit, Motor failure and Side shift overload are off.	
7.	Set all units to Remote-control	

8.	Set the speed on the remote-control console to slow.	 <p style="text-align: center;"><b>SPEED</b></p>
9.	Select the two 'passive' units on the remote-control console	 <p style="text-align: center;"><b>RAM SELECT</b></p>
10.	Manoeuvre the header beam of the units attached to the (future) bottom of the load right above the load.	
11.	Attach the bottom of the load to the header beam.	
12.	De-select the passive units on the remote-control console	
13.	Manoeuvre the header beam of the active units right upon the (future) top of the load.	
14.	Attach the header beam to the load	
15.	Extend the cylinder for <b>5 cm</b> .	 <p style="text-align: center;"><b>LIFT</b></p>
16.	<p>Let the units travel towards the passive units for <b>5 cm</b> in such a way that the lifting eyes of the load are once again directly underneath the header beam.</p> <p>Verify that the lifting eyes are straight underneath the header beam with in tolerance of 0.2°. Use a plumb line, a laser or a theodolite</p>	 <p style="text-align: center;"><b>TRAVEL</b></p>
17.	Repeat the steps 14 .. 16 until the load has been tilted completely	
18.	Switch the unit off	
19.	Switch the remote-control console off	




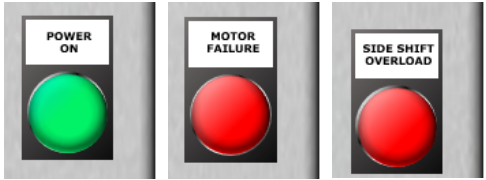
## 8 Solve problems

This chapter describes localization and solving of problems.

- A main problem localization procedure is given.
- A list of possible problems is given, together with causes and possible solutions.

### 8.1 Main problem localization procedure




When during lifting or other use of the System problems occur, follow the steps below to solve the problem.


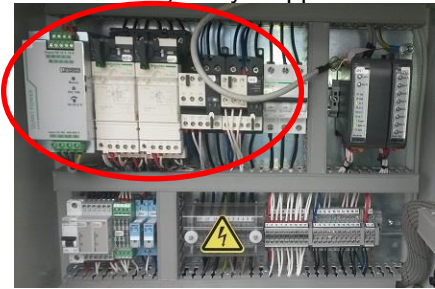



1.	Verify that no Emergency button is activated: Is the indicator on the control panel lit?	
2.	Is there a technical problem in one of the units? Check the Control Panel of all units. <ul style="list-style-type: none"> <li>• Power on should be lit</li> <li>• Motor failure should be off</li> <li>• Side shift overload should be off</li> </ul>	
3.	Is there an overload problem? Check the displayed loads on the remote-control console.	
4.	Are hydraulic leakages visible?	

### 8.2 List of problems and solutions

The table below lists a number of errors and problems which may appear during the use of the System, together with possible causes and solutions.

Symptom	Possible cause	What to do...
<b>Main problems</b>		
Load value “-300” displayed <i>(large negative)</i>	Faulty or loose wiring	Check the wiring Call Enerpac
All units selected, but none moves up	Cylinder at end position?	-
	One of the hydraulic motors stopped	Press the START button [10] on the Control Panel to restart
	Emergency pressed?	Reset the Emergency. See section 6.1 “The use of the emergency buttons”

Symptom	Possible cause	What to do...
All units selected, but only one moves up	Height measurement was not zeroed.	Zero the height measurements. Use the remote-control console. 
After switching on the Control Panel of a Unit, the error "communication timeout" is displayed on the remote-control console	This is normal behaviour due to time needed by the starting-up processes.	Wait for approximately 30 seconds
No display indication after switching on the remote-control console	Battery is low	<ul style="list-style-type: none"> <li>• Charge the battery for at least 4 hours, or</li> <li>• Connect the power supply</li> </ul>
<b>Reports on the display of the remote-control console</b>		
"Emergency pressed"	An Emergency button was pressed, either on one of the unit or on the remote-control console.	Reset the emergency
"Communication timeout"	Radio disturbed	Use cable connection
"**" visible behind the RAMs"	No problem	Appears when the cable connection is used
"System not ready"	Initiation message	Wait a 20 seconds
"Stroke measurement out of range"	Measurement counter defect	Replace the device
	Fault in the wiring	Repair the wiring
	Height measurement cable snapped	Check the cable
"Load measurements out of range"	Sensor defect	Replace the sensor or contact Enerpac.
	Fault in the wiring	Check the wiring
"Drive sensor error" (All Units stop driving)	One of the travelling distance measuring devices is defect.	Change the sensor or contact Enerpac.  <b>Caution:</b> If you do not have a spare sensor, you might remove all driving sensors of all Units. The System will be operational again, BUT WITHOUT DRIVING SAFETY! IT IS ON YOUR OWN RISK.
	Too long misalignment between the Units	The sensor itself slips. Clean the sensor and the track.
		One of the units is obstructed
"Engine still"	Electro motor of the indicated unit is not running	Start the motor. 
"Overload"	Too much weight on one of the booms	If on one cylinder: the load is not divided equally over the System. Else: reconsider your lifting operation with reference to the weight of the Load

Symptom	Possible cause	What to do...
<b>Mechanical and electrical problems</b>		
The System does not travel	The two Bolts of the driving motors of the Units are loose	Fasten the bolts
	One of the hydraulic valves is defect	Repair the valve; Contact Enerpac.
The System does not lift	Hydraulic valve defect	Call Enerpac
	unit is switched off	Switch the unit on. 
The cylinders raise unequally	Problem with oil flow or leakage.	Contact Enerpac
The System cannot lower the load	Problem with oil flow or leakage.	Contact Enerpac
The Side Shift does not move	Side shift not connected	Connect the Side Shift
	Thermic safety relays tripped 	Open the Electrical Cabinet and reset the relays indicated with 10QF2. See the picture. If not successful then Contact Enerpac.
Indicator "Invertor Failure" on the Electrical Cabinet is lit		Try to start the motor. 
Indicator "Side Shift Overload" on the Electrical Cabinet is lit		If not successful the open the Electrical Cabinet and reset the relays indicated with 11QF2; see the picture. If not successful then Contact Enerpac.
		Try to start the motor.  If not successful then open the Electrical Cabinet and reset the relays indicated with 10QF2; see the picture. If not successful then Contact Enerpac.



**Hazard:** Performing repairs on the system may cause dangerous effects when not executed by well-skilled personnel.



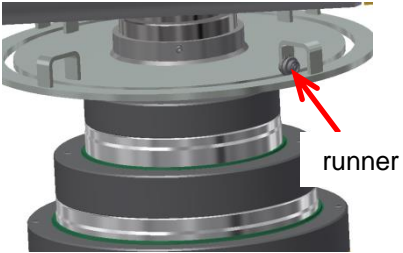

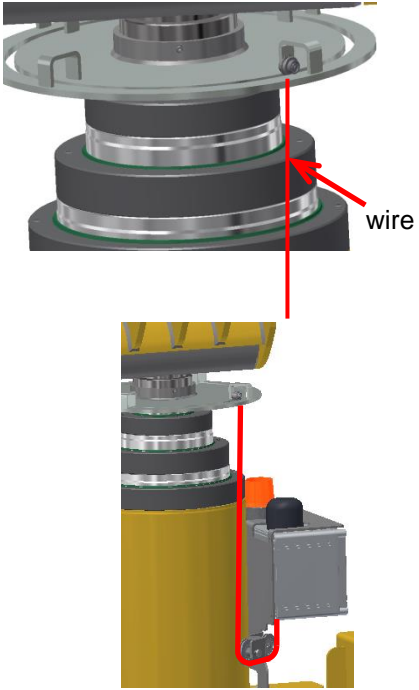
**NB:** The table is meant as a first aid kit. Contact Enerpac if you need assistance.

## 8.3 Reparation of the wire of the stroke sensor



**NB:** The wire is mounted permanently. The procedure is only applicable for reparation purposes. After the wire was mounted, the system has to be calibrated.

### 8.3.1 Mount the wire

<p>1. Check whether the plate is clean, and the runner can move light and freely.</p>	 <p>runner</p>
<p>2. Attach the wire on the runner on the plate.</p> <p> Caution: don't let snap. It may damage the sensor.</p>	 <p>wire</p>

## 8.3.2 Calibrate the stroke sensor

This paragraph describes how to calibrate the stroke sensor, which measures the height of the boom.



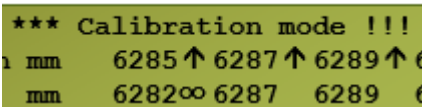
**NB:** Calibration has to be performed when stroke sensors were changed, so calibration is not part of the daily routine.






The main principle of calibration is as follows:

The computer continuously receives the values of all four stroke sensors. During calibration the cylinders are retracted to the very minimum, and then extended to the very maximum. The computer relates the lowest received value to the minimum height of the unit, and the highest received value to the maximum height.

**NB:** More units can be calibrated simultaneously.

To calibrate, proceed as follows:

1.	Preconditions: <ul style="list-style-type: none"> <li>• The remote-control is switched off</li> <li>• All units are switched off.</li> </ul>	
2.	Switch the remote-control console on.	
3.	Set "Speed" on the remote-control console to the 'hare' (high speed)	
4.	Press "Zero lift" and keep it pressed while you switch the remote-control console on.  Keep "Zero lift" pressed until the message "System not ready" is shown  Then release the button. <i>The remote-control console is now in calibration mode.</i>	
5.	Release the "Zero lift" button. <i>The "Calibration mode" message appears on the display.</i>	

6.	<p>You can calibrate more units simultaneously. Switch all unit which you want to calibrate, to on.</p> <p>Start their motors.</p>	
7.	<p>Select the unit(s) on the remote-control console.</p>	
8.	<p>Retract the cylinders to their very minimum position.</p>	
9.	<p>Extend the cylinders to the very maximum position</p>	
10.	<p>Deselect the units.</p> <p><i>The stroke sensors have been calibrated. The message "Calibration succeeded" is shown.</i></p> <p><b>Attention:</b> <i>If communication was poor during calibration, the following message appears: "Calibration failure". If so, then restart the procedure.</i></p> 	
11.	<p>Switch the remote-control console off.</p>	
12.	<p>Switch the remote-control console on.</p>	
13.	<p>Verify the displayed height. It should be the maximum position.</p>	
14.	<p>Retract the cylinder to the very minimum position.</p>	
15.	<p>Verify the displayed position. It should be approximately zero.</p>	

## 9 Storage


### 9.1 System

When the system is stored then retract all cylinders.

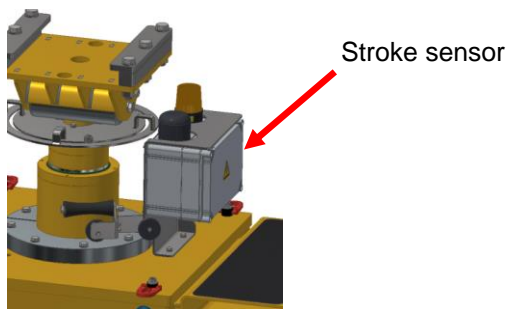
Requirements for storage of the System:

- 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.  
The tarpaulin is not included in the delivery, but can be added as an option.
- Long-term storage:  
For long-term storage a dry and closed space is recommended.

For storage temperature of the system see section 3.3.1 “Main specifications”.

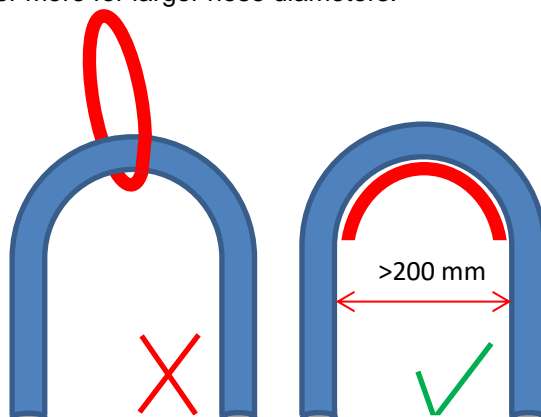
 **NB:** During storage in the open air, cover the units with a tarpaulin in order keep electrical and other moisture-sensitive components dry.  
*The tarpaulin is not included in the delivery but can be added as an option.*

Make sure to keep the electronics dry.  
Pay special attention to the stroke sensor.



### 9.2 Hydraulic hoses

- Store hoses in a **frost-free**, cool, dry space with medium air humidity (condensation free).
- Keep hoses out of direct **sunlight** (UV radiation).
- Keep hoses out of the outlet flow of ventilators (drying effect).
- Protect hoses against exposure to **ozone** (released during welding work).
- Ozone causes accelerated ageing of hoses (splitting due to dryness).
- Protect hoses against dirt and **moisture**.
- Preferably store hoses in a **horizontal** position.  
When you store the hoses in **vertical** position use hose brackets with a bend **radius** of at least 200 mm, or more for larger hose diameters.



### 9.3 Remote-control unit

---

Store the remote-control with a maximum charged battery in case of storage for more than one month. After six months of storage the battery will still be charged for approximately 40% in case of an ambient temperature of 25°C.



**Attention:** During storage in the open air, cover the units with a tarpaulin in order keep electrical and other moisture-sensitive components dry.

If the stroke meter gets wet, its functioning may be impaired. So pay special attention to the encoder box.

*The tarpaulin is not included in the delivery but can be added as an option.*



## 10 Maintenance

Keep the machine in good condition to obtain optimum performance from your machine and to guarantee the safety of the users.

This chapter describes

- the maintenance jobs to be carried out
- the required skills for the maintenance jobs
- the time-intervals the jobs have to be performed in.

The time intervals are given for regular frequency of use and normal severity of service conditions.

The time intervals have to be taken proportionally shorter when

- the system is applied more often than regular, which is once per month.
- the system is used in exceptional service conditions, like wet or salty environments
- the system is applied to the limits of its capacity
- the system is applied for special service. The time interval has to be discussed with Enerpac.

The time intervals may be varied based on experience gained on the service life of systems used in similar circumstances.

- If the system was idle for at least 6 months, all inspections as listed in the following section with a prescribed frequency of at least 6 months have to be performed.
- Prior to use, all new, altered, modified, or repaired hydraulic gantry systems shall be inspected to verify compliance with the applicable provisions of this section. Written records are not required.



### NB:

- Only perform maintenance on the units if they are not under load
- Only perform maintenance on the units if the header beams have been removed.
- Any maintenance procedures not detailed in this section can only be performed by or in consultation with Enerpac.
- Only apply spare parts provided by Enerpac. If non-Enerpac parts are applied, all guarantees will be void.



**NB:** If the system has been idle for more than 12 months than it shall be inspected prior to use completely.

### 10.1 Rules to be observed for maintenance

Due to the regulations as stated in Ref 7 "ASME B30.1-2015" observe the following rules for maintenance:

1. If the system was **idle** for at least 12 months, all inspections as listed in the following section with a prescribed frequency of at least 12 months have to be performed.
2. Prior to use, all **new, altered, modified, or repaired** hydraulic components shall be inspected to verify compliance with the applicable provisions of this section. Written records are not required.
3. Only perform maintenance if the system is **not under load**.
4. Any maintenance procedures **not detailed** in this section can only be performed by or in consultation with Enerpac.
5. Only apply **spare parts** provided by Enerpac. If parts of different brand are applied, all guarantees will be void.
6. The warranty shall void if any **modifications** are made to the powerpack without the consent of the manufacturer.
7. Make certain that you are **familiar** with the powerpack and its use. Read the user manual carefully and in full and request instructions from the operator where needed.
8. Only perform maintenance work if you are **qualified** to do so. Unauthorized personnel may not open the Power pack.
9. Follow all instructions given on the **warning symbols** on the powerpack.
10. Follow all **safety instructions** in this manual.
11. When working with **flammable liquids**, take the applicable safety regulations into account.

12. Only perform maintenance work after the powerpack has been **shut down**. Before starting maintenance, make sure the powerpack is secured against unauthorized use. Put up warning signs.
13. Make certain that the hydraulic system is **not under pressure**. Use the manometer.
14. If maintenance has to be executed while the system is **running** then a person has to be present to supervise, and to stop the machine if needed. This also applies for work on the electrical system if the system needs to be powered.
15. Do not **spill** any oil and similar fluids. Be mindful of the environment and the costs of cleaning up.
16. Make certain that you apply personal protection equipment (**PPE**) and take any other safety precautions required by the working conditions.
17. Make sure that you know the location of **fire alarms**, firefighting facilities and fire extinguishers.
18. Only use suitable work **equipment**. Prevent damage due to use of unsuitable equipment.
19. Without the express consent of the manufacturer, you are not allowed to make any **changes**, additions or adjustments to the Powerpack which affect the safety of the machine. This also applies to installation and adjustment of safety devices, covers and valves and to welding work on load-bearing parts.
20. Make certain that the powerpack is made **ready for operation** after the maintenance work was been completed. Inform the operator.

## 10.2 Responsibilities

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Due to the regulations as stated in Ref 7 "ASME B30.1-2015" observe the following rules for responsibilities.

The maintenance tables indicate for each maintenance job whether it has to be performed either by the owner or by the manufacturer.

Contact the manufacturer for the following maintenance work:

- Adjusting the pressure in the hydraulic system.
- Adjusting and repairing hydraulic pumps and setting up hydraulic pumps.
- Adjusting and repairing control valves for all main functions.
- Adjusting the electrical system and repairs to the control system.
- Replacing parts.

In these cases, the maintenance work for the owner is limited to identification of a fault.

## 10.3 Mechanical

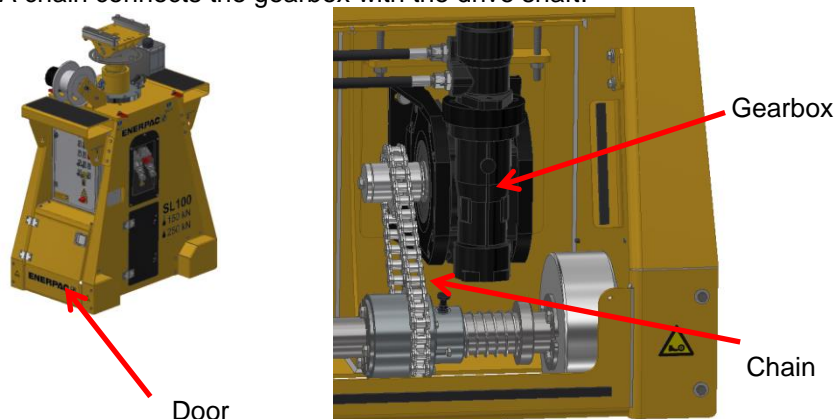
Perform maintenance on the mechanical part according to the list as shown below.  
Record all activities in Appendix E "Logging Maintenance".

Subject	Action	Person O (owner) EE (Enerpac expert)	First 40 hours	8 hours / daily	40 hours / weekly	Each 500 hours / yearly	2000 hours / 5 year	10000 hours / 10 year	Remarks
<b>1. Main construction</b>									
1.1. Main construction	Visual checking of all welding	O				X			
	Visual check painting	O				X			
	Visual check on corrosion and damages	O			X				
	Check all bolts.	O				X			
	Visual check of the hoisting lugs	O				X			
	Inspect the readability of the warning signs. Clean if obscured by dirt. Restore if damaged or even no longer present	O		X					
	Check and replace the oil of the gearbox. See section 10.3.7 "Check and replace the oil of the gearbox"	O				X	X		
	Lubricate the swivel. See section 10.3.6 "Lubricate the swivel"	O	X			X			Or 50 hours
	Lubricate the freewheel system. Use Kroon Oil multi-purpose grease 3.	O	X			X			Or 50 hours
<b>2. Chain of the units</b>									
2.1. Lubricate the chain	Lubricate the chain. See section 10.3.1 "Lubricate the chain"	O				x			
2.2. Tension the chain	Tension the chain. See section 10.3.1 "Lubricate the chain"	O				X			
2.3. Maintain the freewheel mechanism	Visual check on corrosion and damages	O			X				

<b>3. Side shift unit</b>									
3.1. Lubricate the chain	Lubricate the chain.	O				X			
3.2. Tension the chain	Tension the chain.	O				X			
<b>4. Rotation anchor</b>									
4.1. Main construction	Visual check of all welding	O				X			
	Visual check painting	O				X			
	Visual check on corrosion and damages	O			X				
	Check all bolts.	O				X			
4.2. Lubricate pivot bearing	Lubricate the pivot bearing.	O				X			

## 10.3.1 Lubricate the chain

A chain connects the gearbox with the drive shaft.

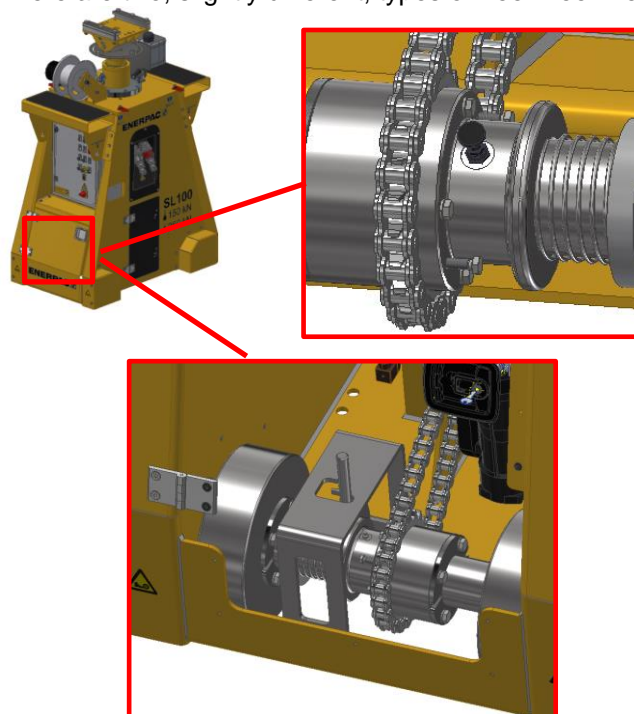


To maintain the drive chain, proceed as follows:

1.	Make sure the power supply has been switched of
2.	Open the front door
3.	Visually inspect the chains and the gears
4.	Lubricate the chain with Kroon Oil multi-purpose grease 3
5.	Close the front door

## 10.3.2 Maintain the freewheel mechanism

There are two, slightly different, types of freewheel mechanisms.



To maintain the freewheel mechanism, proceed as follows:

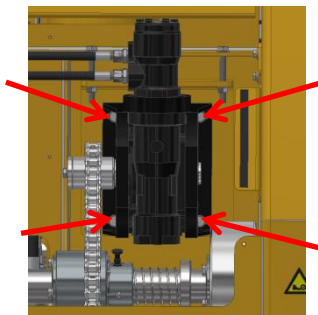
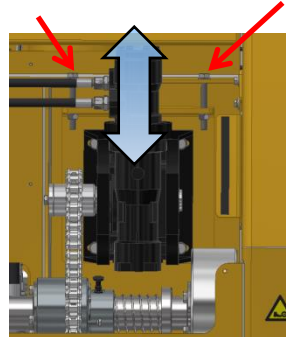
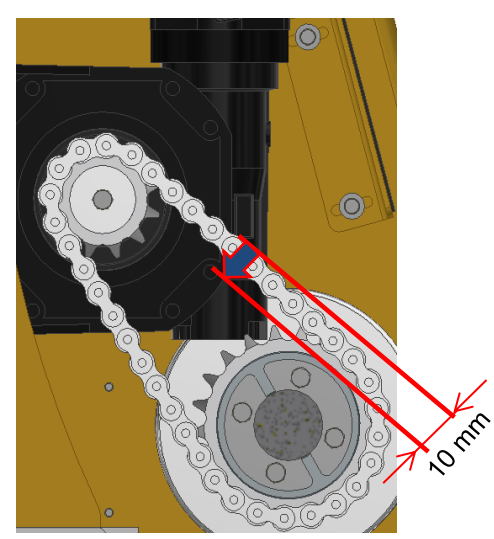
1.	Make sure the power supply has been switched of
2.	Open the front door
3.	Visual check on corrosion and damages Can the hub move easily along the shaft?

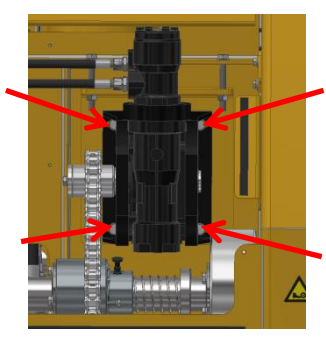
4.	Lubricate the mechanism with Kroon Oil multi-purpose grease 3 if necessary. Use the grease nipple (SL300, SL400N) or spread it around the shaft (SL100, SL200).
5.	Close the front door

### 10.3.3 Tension the chain

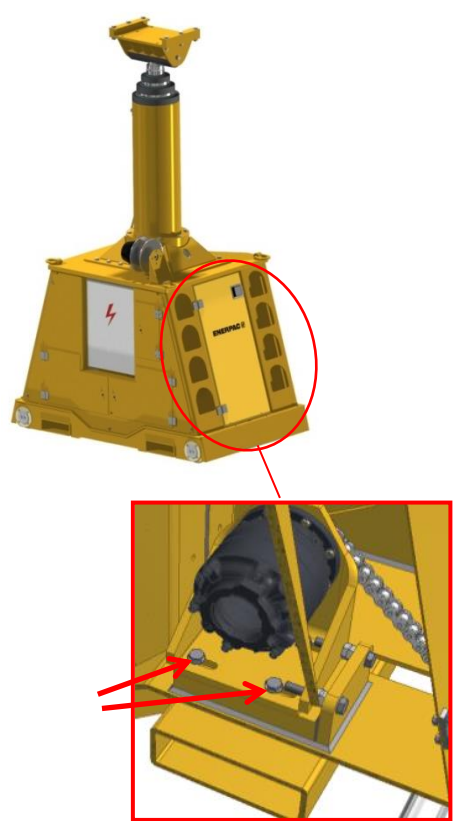

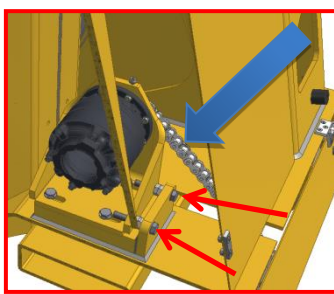
To tension the drive-chain, proceed as follows.


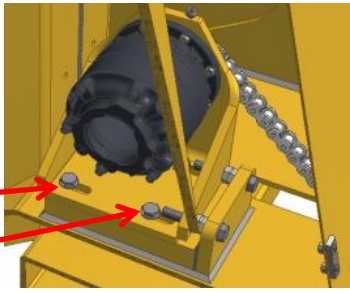
#### 10.3.3.1 SL100, SL200, SL300 and SL400N

1.	Make sure the power supply has been switched of	
2.	Open the front door	
3.	Loosen the four bolts of the gearbox	
4.	<p>Tension the chain by turning the tensioning bolts.</p> <p>Keep the gearbox level</p>	 

5.	Tighten the four bolts of the gearbox according to Appendix G "Torque settings".	
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### 10.3.3.2 SL400

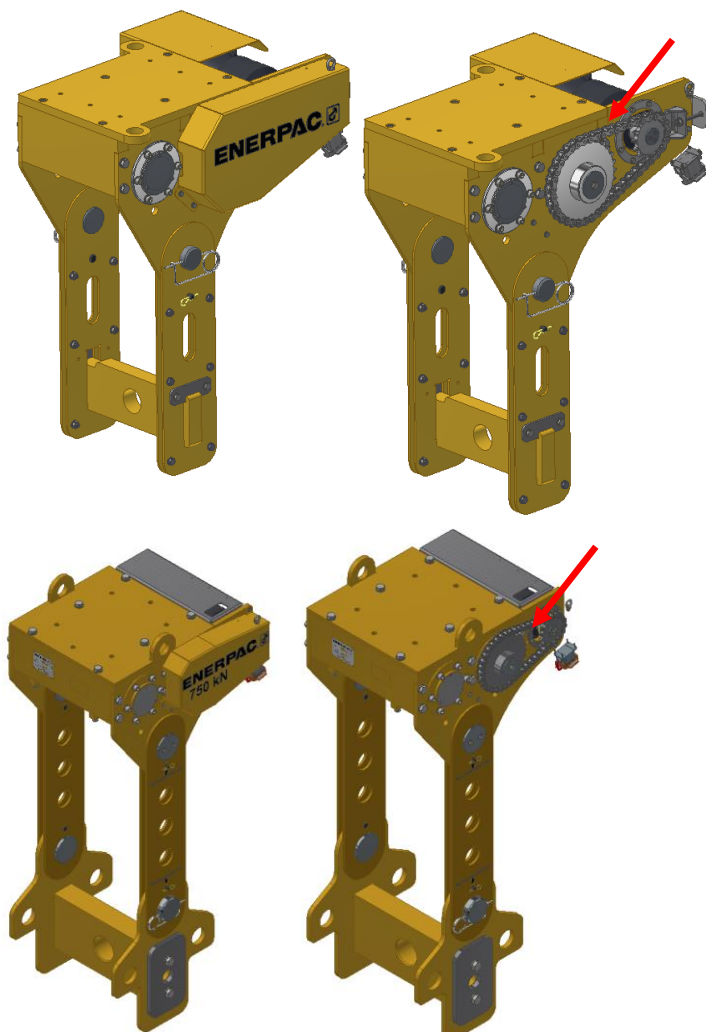
<ol style="list-style-type: none"> <li>1. Open the front door.</li> <li>2. Loosen the four bolts of the subframe</li> </ol>		
3.	<p>Tension the chain by turning the bolts. <i>The subframe will shift.</i></p> <p>The slack in the middle of the chain shall be 10 mm. Use hand power.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <p>Caution: tensioning the chains too tight might harm the driving mechanism</p> </div>	

<p>4. Tighten the bolts of the subframe.</p> <p> <b>NB:</b> Make sure the sub frame is kept parallel</p>	
<p>5. Close the front door</p>	

### 10.3.4 Lubricate the side shift units

The side shift units are provided with chains, which have to be lubricated. Use “Kroon Oil multi-purpose grease 3”.

Both types of side shift units are shown below:

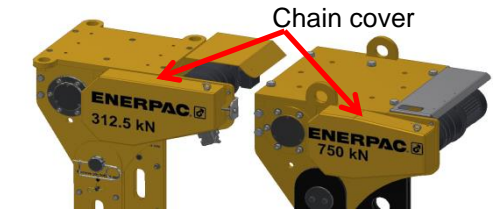
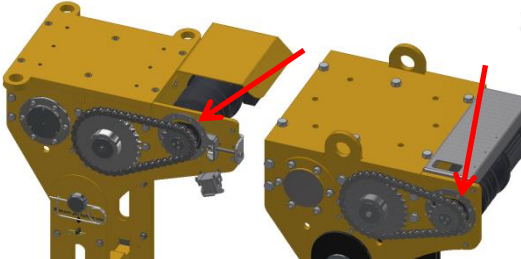
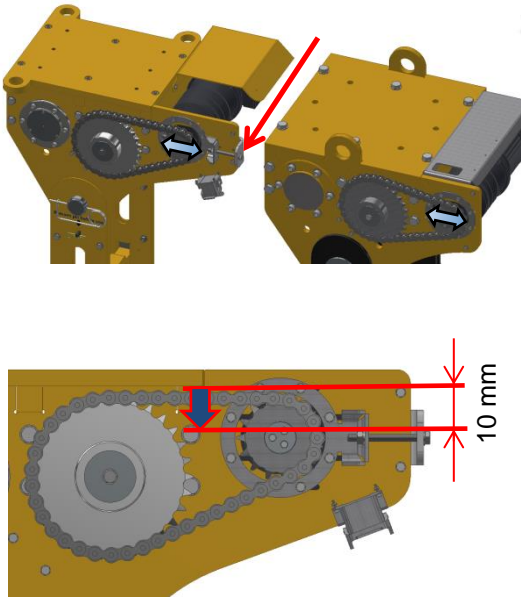
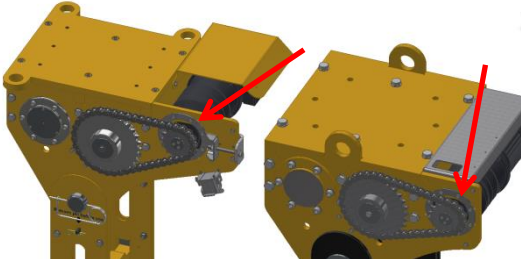


*(The bearings of the side shift units were greased for lifetime.)*



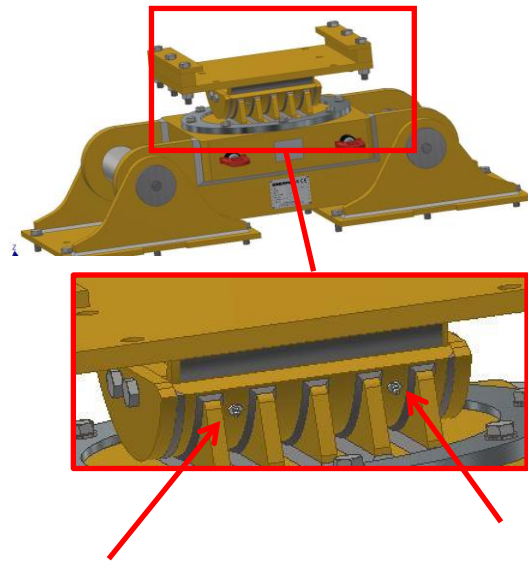
## 10.3.5 Tension the chain of the side shift units

To tension the drive-chain, proceed as follows:

1.	Make sure the power supply has been switched of	
2.	Remove the chain cover	
3.	Loosen the bolts of the gearbox and clamping ring	
4.	Tension the chain by turning the tensioning bolts or moving the gearbox backwards.	
5.	Tighten the bolts of the gearbox and clamping ring according to Appendix G "Torque settings".	
6.	Keep the gearbox level.	

### 10.3.6 Lubricate the swivel

Lubricate the nipples of the swivel; two at both sides. Use 5 strokes of Kroon Oil multi-purpose grease 3.



### 10.3.7 Check and replace the oil of the gearbox

#### 10.3.7.1 SL100, SL200, SL300 and SL400N

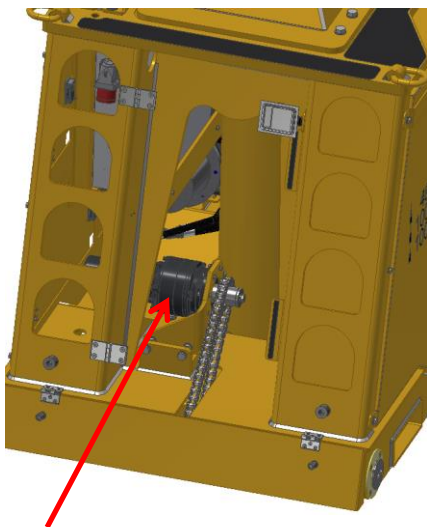
The SL100, SL200, SL300 and SL400N are equipped with a gearbox which is lubricated for life.

#### 10.3.7.2 SL400

For the SL400, perform a purity test on the oil of the gearbox. For purity requirements reference is made to section 3.3.1 "Main specifications".

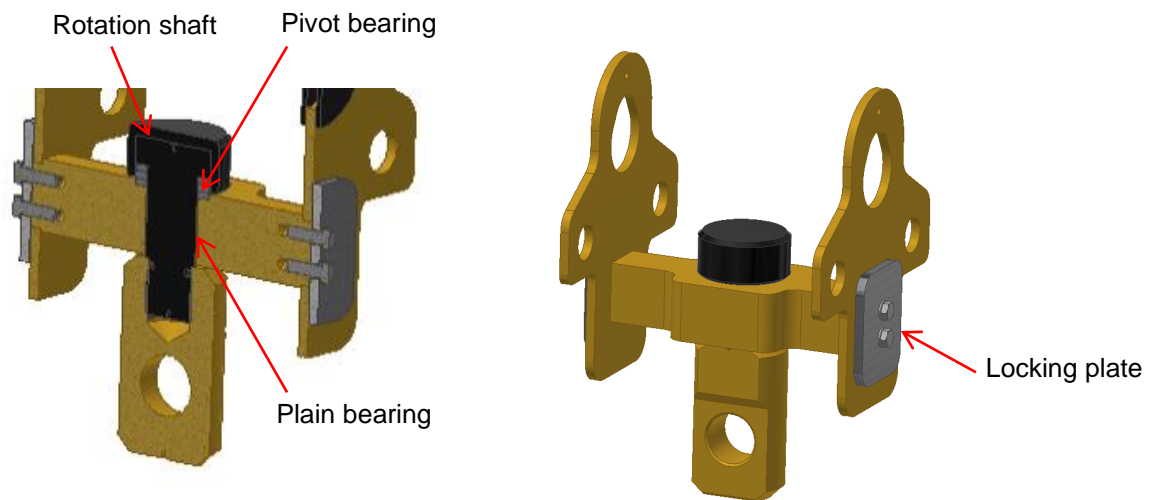
Change the oil of the gearbox

If the yearly purity test points out or with a periodicity as given in the maintenance table.  
Use 1.8 litres of oil type "ISO VG 320 mineral oil".



### 10.3.7.3 Rotation anchor

The figure below shows the construction of the rotation anchor.



Lubricate the pivot bearing:

- Remove the Rotation shaft cap.
- Lubricate the pivot bearing. Use "Kroon Oil multipurpose grease"

## 10.4 Hydraulics

This section lists all maintenance jobs for the hydraulics.

Record all activities in Appendix E "Logging Maintenance".

For hydraulic fluid safety information sheet, see Appendix F "Hydraulic fluid safety information".

Regard the following:

- Before starting maintenance, make sure no pressure is present in the hydraulic system.
- All inspections up to yearly have to be performed if the system has been idle for at least 12 months. The system shall only be returned to service when approved by a qualified person as described that section.
- All replacement parts including the ram, hoses, couplings, seals, valves, and caps shall meet or exceed the original equipment manufacturer's specifications.



**NB:** Enerpac strongly advises to apply parts as bought from Enerpac.



**Hazard:**

Applying parts which do not apply to the specifications may cause hazards to personnel and the system. Before removing a component of the hydraulic system, check if there is no hydraulic pressure left within the hydraulic system.



**Hazard:** High pressured hydraulic oil spray can cause physical injuries, fire or death of personnel.

Perform maintenance on the hydraulics of the system according to the list below  
Record all activities in Appendix E "Logging Maintenance".

Subject	Action	Person O (owner) EE (Enerpac expert)	First 40 hours	8 hours / daily	40 hours / weekly	Each 500 hours / yearly	2000 hours / 5 year	10000 hours / 10 year	Remarks
<b>1. Hydraulic pump and tank</b>									
1.1. Pump	Check on oil leakage	O		x					
	Check if the bolts are still tightened	O	x			x			
	Check on damages. Check the paintwork.	O		X					
	Wipe it clean and free from dust	O		X		X			
1.2. Hydraulic tank	Check on oil leakage, damages and paint work	O		X					
	Check if the bolts are still tightened	O	x			x			
	Replace all seals	EE						X	
	Replace the level gauges	EE						X	
	Drain the tank (water and sludge)	EE					x		
1.3. Valves	Check on oil leakage and damages	O		X					
	Check if the bolts are still tightened	O	x			X			
	Replace all seals	EE						X	
	Check all valve settings	O					x		
1.4. Manifolds	Check on oil leakage and damages	O		X					
	Check if the bolts are still tightened	O				x			
1.5. Oil	Take an oil sample to analyze	EE					x		Change if necessary
	Replace the hydraulic oil. See setion 10.4.1 "Drain the oil" See section 10.4.2 "Filling the tank"	EE						x	
	Check the oil level	O		x					
1.6. Hydraulic filter	Replace the filter element. See section 10.4.3 "Replace the filter element"	O				X		X	And if indicated

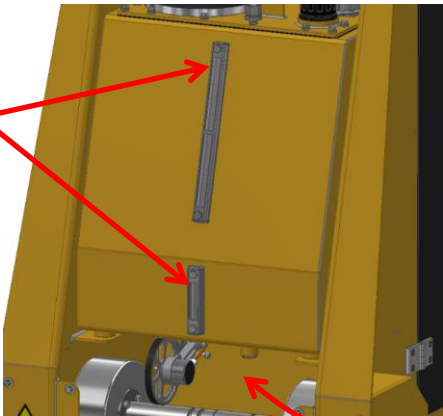
	Replace the seals of the filter housing	EE						X	
1.7. Breathers	Replace the breather	EE				X			
1.8. Bellhousing	Check on damages	O					X		
	Check if the bolts are still tightened	O	X					X	
	Replace motor pump coupling	EE						X	
<b>2. Hydraulic connections</b>									
2.1. Pipes, hoses and brackets	Check on oil leakage and damages	O		X					
	Check if the couplings are tightened well.	O	x			x			
	Replace all seals within the piping (Walform)	EE					X		
	Replace all hoses	EE					X		
	Replace all plastic brackets	EE							
2.2. Couplings and quick-screw couplings	Check on oil leakage and damages	O					X		
	Check if the couplings are tightened well.	O					X		
	Replace all seals of the couplings	EE		X					
	Replace fast couplings and screw couplings	EE		x		x			
2.3. Gauges, measurement sensors	Check on damages	O		X					
	Check the tightening bolts, nuts and components	O		x		X			
	Replace all seals	EE						X	
	Replace all gauges	EE						X	
<b>3. Housing</b>									
3.1. Common	Check on damages and paint	O		X					
	Check if the bolts are still tightened	O	x			X			
	Replace all seals, door seals and inspection hatches	EE						X	
	Grease the hinges and locks	O				X			
	Replace engine feet	EE						X	
<b>4. Cylinders</b>									
4.1. Common	Check on leakages	O		X					
	Check if the bolts are still tightened	O	x			x			
	Replace all seals	EE						X	
	Grease the bearings	EE			x				

## 10.4.1 Drain the oil


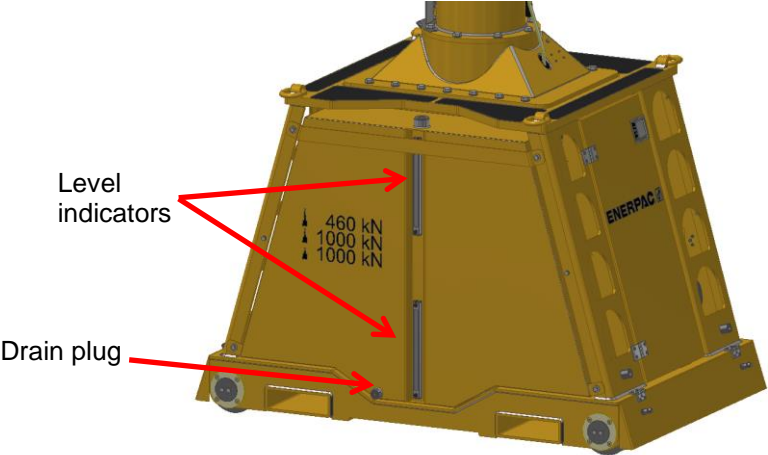
The oil in the tank has either to be refreshed or a purity test has to be performed. For purity requirements reference is made to section 3.3.1 "Main specifications".

Proceed as follows:

1.	Ensure that the cylinder is completely retracted
2.	Drain the oil from the tank. Use the plug at the downside of the tank. While draining, keep an eye on the oil level indicators. While draining, keep an eye on the oil level indicators.



Drain plug


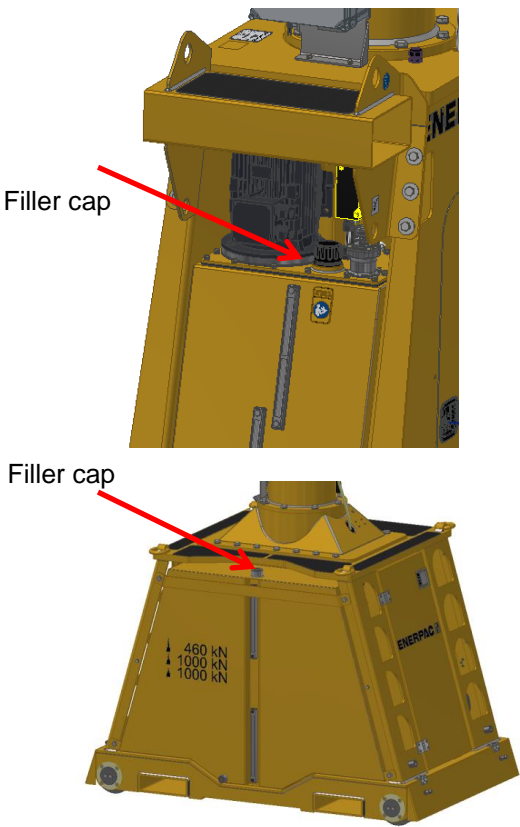



**Attention:** Dispose the oil responsibly

## 10.4.2 Filling the tank

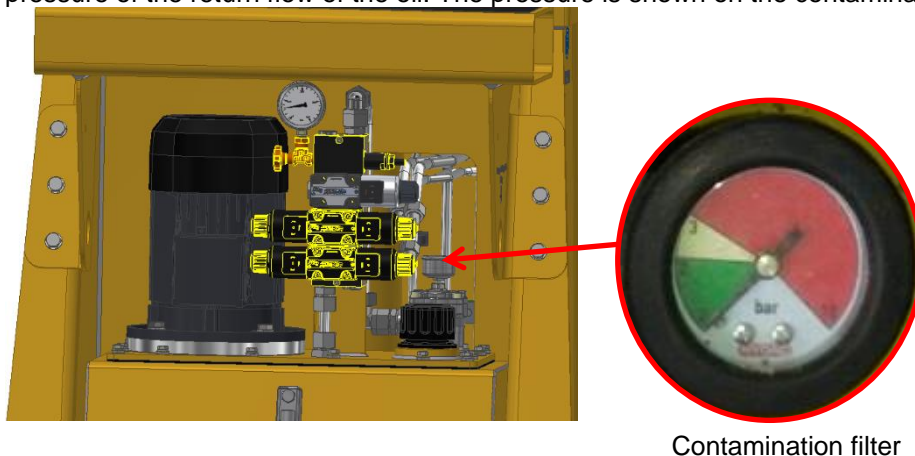
To fill the tank, proceed as follows:

1.	Make sure the Cylinder of the Unit is fully retracted
2.	Use the fill/bleed opening to fill the tank with oil.

<p>3. Use oil type as specified in section 3.3.1 “Main specifications”.</p> <p>Monitor the level indicator.</p> <p> <b>Attention:</b> Do not fill the tank over the maximum.</p>	
<p>4. Make sure that the oil is free of air by circulating the oil through the system by starting the System and let it run for 10 minutes</p>	

### 10.4.3 Replace the filter element

The return filter cleans the oil that flows back into the tank. Due to contamination of the oil the permeability of the filter will decrease, which causes a raise of the pressure of the return flow of the oil. The pressure is shown on the contamination indicator:







- Green: the pressure is 0 .. 2 bar  
The filter is fine.
- Yellow: the pressure is 2..3 bar  
The filter is still working, but has to be replaced as soon as possible.
- Red: the pressure is over 3 bar.  
Oil is no longer filtered.  
Replace the filter element immediately.

The filter element has to be changed:

- When the oil is changed
- When the indicator shows yellow or red
- Once per year

To replace the filter, proceed as follows:

1.	Unscrew the return filter cap
2.	Remove the internal filter element
3.	Put a new filter element. To ensure correct operation, only replace with an element with equal brand and type. Use Hydac return filters. The exact type is listed on the parts list of the machine

## 10.5 Electrics

Perform maintenance on the electrics of the system according to the list below.  
Record all activities in Appendix E "Logging Maintenance".

Subject	Action	Person O (owner) EE (Enerpac expert)	First 40 hours	8 hours / daily	40 hours / weekly	Each 500 hours / yearly	2000 hours / 5 year	10000 hours / 10 year	Remarks
1. Cables and connectors									
1.1. General	Check on damages	O		X					
2. Devices and cabinets									
2.1. General	Check on leakages and damages	O			X			X	
	Check if the bolts and nuts are still tightened	O		x		x			
	Replace all seals	E						X	
2.2. Main switch	Replace the main switch	EE						X	
2.3. Remote-control device	Replace the battery	EE					x		

## 11 Quality

---

Not applicable.

## 12 Dismantling the system

---

To dismantle the system at the end of its lifetime, proceed as follows:

- Drain the fluids like:
  - hydraulic oil,
  - lubricating oil,
  - coolant,
  - and fuel.
- Remove the batteries.
- Dismount the electric components and electric wiring.
- Dismount rubber and plastic components.
- Dismount the metal components.

Collect all material, sort it and let it be recycled by a specialized company.



**Attention:** Dispose of all material in a responsible manner.

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# Appendices

## A. Checklist for planning

### 1. Project

Project	
Customer	
Location	
Date	

### 2. Planning operation

<b>Type of operation</b>		
<input type="checkbox"/>	Lift / lower	
<input type="checkbox"/>	Move in longitudinal direction	
<input type="checkbox"/>	Move in transversal direction	
<b>The system</b>		
<input type="checkbox"/>	Lifting capacity of the most heavily loaded unit	
<input type="checkbox"/>	Capacity of the side shift	
<input type="checkbox"/>	Capacity of the header beams	
<input type="checkbox"/>	Minimum force on each unit is sufficient	
<input type="checkbox"/>	Maximum force per anchor or side shift does not exceed the max	
<input type="checkbox"/>	The force on the header beam does not exceed the max	
<b>Side shift unit</b>		
<input type="checkbox"/>	Required capacity	
<input type="checkbox"/>	Rotation anchor applied? If so, can the load be rotated without hitting any obstacle?	Y/N
<input type="checkbox"/>	Top swivel applied?	Y/N
<input type="checkbox"/>	Sling anchor applied?	Y/N
<input type="checkbox"/>	Extended anchor plates applied?	Y/N
<b>Sling guides</b>		
<input type="checkbox"/>	Are sling guides applied?	Y/N
<input type="checkbox"/>	Is the capacity of applied sling guide type sufficient?	Y/N
<b>The load</b>		
<input type="checkbox"/>	Mass of the load	...
<input type="checkbox"/>	Centre of gravity of the load with respect to the units	
<input type="checkbox"/>	Dimensions of the load.	...
<input type="checkbox"/>	Allowable pressure on the subsoil before subsidence happens.	...
<b>The side load</b>		
<input type="checkbox"/>	Max side load	

<b>The operation</b>			
<input type="checkbox"/>	Determine the lifting height	... mm	
<input type="checkbox"/>	Stage extension	1 / 2 / 3	
<input type="checkbox"/>	Capacity in highest stage	... kN	
<input type="checkbox"/>	The travelling distance	... m	
<b>The environment</b>			
<input type="checkbox"/>	Bearing capacity of the subsoil ( $\sigma$ toe)	..... Tonne/ m <sup>2</sup>	
<input type="checkbox"/>	Is additional supporting material under the skid tracks necessary?		
<input type="checkbox"/>	The wind load	Maximum permissible wind speed X-direction	... m/s
		Maximum permissible wind speed Y-direction	... m/s

### 3. Commitment

Planning by:

Date:

Signature:

Approved by:

Date:

Signature:

## B. Checklist for installing the System

### 1. Project

Project	
Customer	
Location	
Date	

### 2. Planning

<input type="checkbox"/>	Checklist A “Checklist for planning” is completed and signed off.
--------------------------	---

### 3. Foundation

<input type="checkbox"/>	Foundation underneath skid tracks has been put in accordance with the instructions in this manual. If foundation is applied
--------------------------	---

### 4. Skid tracks

<input type="checkbox"/>	Skid tracks placed according to instructions in manual
<input type="checkbox"/>	Skid tracks aligned according to instructions in manual.
<input type="checkbox"/>	Skid tracks connected according to instructions in manual.

### 5. Units

<input type="checkbox"/>	Move all units forwards and backwards over a short distance using the remote-control console, to ensure you have set the positive driving direction correctly.
<input type="checkbox"/>	Slide all cylinders in and out over a short distance. (This assures the communication functions properly.)
<input type="checkbox"/>	Check the status of the battery of the remote-control console
<input type="checkbox"/>	The stroke sensors are undamaged

### 6. Header beams

<input type="checkbox"/>	Bolts on the swivel tightened to torque in accordance with instructions in manual
<input type="checkbox"/>	Beam is horizontal (level) on the two units

### 7. Side shifts

<input type="checkbox"/>	Side shift mounted in accordance with instructions in manual <i>(If applicable)</i>
<input type="checkbox"/>	Move the Side Shifts to the right and the left over a short distance, to assure the correct positive driving direction

### 8. Visual inspection

<input type="checkbox"/>	Visual inspection: no excessive rust.
<input type="checkbox"/>	No parts of the system are damaged
<input type="checkbox"/>	Visual inspection of the hydraulic components: no oil leakages
<input type="checkbox"/>	Running surfaces of the skid tracks are clean. (Dirt may cause the units to slip)
<input type="checkbox"/>	The units can run freely and are not obstructed.
<input type="checkbox"/>	Inspection of the electrics: electrical cables are undamaged electrical cables cannot be pinched

### 9. Other equipment

Equipment	Length	Capacity	Mass
Lifting straps			
Chains			
Other			

### 10. Commitment

Installations by:

Date:

Signature:

Approved by:

Date:

Signature:



## **C.Final checks**

### **1. Project**

Project	
Customer	
Location	
Date	

### **2. Checks**

<input type="checkbox"/>	Checklist A “Checklist for planning” is completed and signed off.
<input type="checkbox"/>	No parts of the portal lift are damaged
<input type="checkbox"/>	No leakages of the hydraulic components
<input type="checkbox"/>	Drop-zone is cordoned off. No people are inside the unsafe zone. Barriers and tape used.
<input type="checkbox"/>	Running surfaces of the skid tracks are clean.
<input type="checkbox"/>	The units can run freely and are not obstructed.
<input type="checkbox"/>	The weight of the load is indicated on the remote-control console correctly.
<input type="checkbox"/>	The side-load does not exceed 1.5 % of the vertical load

### **3. Suspension of the load**

<input type="checkbox"/>	The anchors on the header beam are in line with the hoisting points of the load.
<input type="checkbox"/>	The lifting straps are short.
<input type="checkbox"/>	The header beams are level
<input type="checkbox"/>	Lifting slings are plumb.

### **4. Commitment**

Checks by:

Date:

Signature:

Approved by:

Date:

Signature:

## D. Recording a lifting operation

### 1. Project

Project	
Customer	
Location	
Date	

### 2. Recording of activities

	Activity	Time
<input type="checkbox"/>	The checklist in Appendix A "Checklist for planning" has been completed and signed off	
<input type="checkbox"/>	Checklist B "Checklist for installing the System" completed and signed off	
<input type="checkbox"/>	Checklist C "Final checks" completed and signed off	
<b>1</b>		
<b>2</b>		
<b>3</b>		
<b>4</b>		
<b>5</b>		
<b>6</b>		
<b>7</b>		
<b>8</b>		

	Activity	Time
9		
10		
11		
12		
13		
14		
15		
16		
19		

**3. Commitment**

Executed by:

Date:

Signature:

Approved by:

Date:

Signature:

## E. Logging Maintenance

### Hydraulics

Subject	Action	Person	Date
<b>1. Hydraulic pump and tank</b>			
1.1. Pump	Check on oil leakage, damages and paint work		
	Check if the bolts are still tightened		
	Check on damages		
	Wipe it clean and free from dust		
1.2. Hydraulic tank	Check on oil leakage, damages and paint work		
	Check if the bolts are still tightened		
	Replace all seals		
	Replace the level gauges		
	Drain the tank (water and sludge)		
1.3. Valves	Check on oil leakage and damages		
	Check if the bolts are still tightened		
	Replace all seals		
	Check all valve settings		
1.4. Manifolds	Check on oil leakage and damages		
	Check if the bolts are still tightened		
1.5. Oil	Take an oil sample to analyze		
	Replace the hydraulic oil.		
	Check the oil level		
1.6. Hydraulic filter	Replace the filter element.		
	Replace the seals of the filter housing		
1.7. Breathers	Replace the breather		
1.8. Bellhousing	Check on damages		
	Check if the bolts are still tightened		
	Replace motor pump coupling		
<b>2. Hydraulic connections</b>			
2.1. Pipes, hoses and brackets	Check on oil leakage and damages		
	Check if the couplings are tightened well.		
	Replace all seals within the piping (Waldform)		
	Replace all hoses		
	Replace all plastic brackets		
2.2. Couplings and quick-screw couplings	Check on oil leakage and damages		
	Check if the couplings are tightened well.		
	Replace all seals of the couplings		
	Replace fast couplings and screw couplings		
2.3. Gauges, measurement sensors	Check on damages		
	Check the tightening bolts, nuts and components		
	Replace all seals		

	Replace all gauges		
<b>3. Housing</b>			
3.1. Common	Check on damages and paint		
	Check if the bolts are still tightened		
	Replace all seals, door seals and inspection hatches		
	Grease the hinges and locks		
	Replace engine feet		
<b>4. Cylinders</b>			
4.1. Common	Check on leakages		
	Check if the bolts are still tightened		
	Replace all seals		
	Grease the bearings		

## Mechanical

Subject	Action	Person	Date
<b>1. Main construction</b>			
1.1. Main construction	Visual check of all weldings		
	Visual check painting		
	Visual check on corrosion and damages		
	Check all bolts.		
	Visual check of the hoisting lugs		
	Inspect the readability of the warning signs. Clean if obscured by dirt. Restore if damaged or even no longer present		
	Check and replace the oil of the gearbox		
	Lubricate the swivel Lubricate the freewheel system		
<b>2. Chain of the units</b>			
2.1. Lubricate the chain	Lubricate the chain		
2.2. Tension the chain	Tension the chain		
2.3. Maintain the freewheel mechanism	Visual check on corrosion and damages Can the hub move easily along the shaft?		
<b>3. Side shift unit</b>			
3.1. Lubricate the chain	Lubricate the chain		
3.2. Tension the chain	Tension the chain		
<b>4. Rotation anchor</b>			
4.1. Main construction	Visual check of all welding		
	Visual check painting		
	Visual check on corrosion and damages		
	Check all bolts.		

	Perform the after-operation checks.		
4.2. Lubriate the pivot bearing.	Lubriate the pivot bearing.		

**Electrics:**

Subject	Action	Person	Date
<b>1. Cables and connectors</b>			
1.1. General	Check on damages		
<b>2. Devices and cabinets</b>			
2.1. General	Check on leakages and damages		
	Check if the bolts and nuts are still tightened		
	Replace all seals		
2.2. Main switch	Replace the main switch		
2.3. Remote-Control device	Replace the battery		

## F. Hydraulic fluid safety information

### SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

#### Shell Tellus S4 VE 46

Version 1.2 Revision Date 02.01.2020 Print Date 03.01.2020

#### 1. Identification of the substance/mixture and of the company/undertaking

- 1.1. Product identifier  
Trade name Shell Tellus S4 VE 46  
Product code 001F8443
- 1.2. Relevant identified uses of the substance or mixture and uses advised against  
Use of the Hydraulic oil  
Substance/Mixture This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.  
Uses advised against
- 1.3. Details of the supplier of the safety data sheet  
Manufacturer/Supplier Shell Nederland Verkoopmaatschappij B.V.  
Weena 70  
3012 CM Rotterdam  
Netherlands  
Telephone (+31) 0900 202 2710  
Telefax -  
Email Contact for Safety Data sheet If you have any enquiries about the content of this SDS please email lubricantSDS@shell.com  
1.4. Emergency telephone number National Poison Information Centre (NVIC): Tel. nr. +31 30 - 2748888 (24 hrs a day and 7 days a week). Only for the purpose of informing medical personnel in cases of accidental intoxications.  
+31 (0)10 4313233  
National Poison Information Centre (NVIC): Tel. nr. +31 30 - 2748888 (24 hrs a day and 7 days a week). Only for the purpose of informing medical personnel in cases of accidental intoxications.  
+31 (0)10 4313233

#### 2. Identification of the substance/mixture and of the company/undertaking

- 2.1. Classification of the substance or mixture  
Classification (REGULATION (EC) No 1272/2008)  
Based on available data this substance / mixture does not meet the classification criteria.
- 2.2. Label elements  
Labelling (REGULATION (EC) No 1272/2008)  
Hazard pictograms No Hazard Symbol required  
Signal word No signal word  
Hazard statements PHYSICAL HAZARDS:  
Not classified as a physical hazard according to CLP criteria.  
HEALTH HAZARDS:  
Not classified as a health hazard under CLP criteria.  
ENVIRONMENTAL HAZARDS:  
Not classified as environmental hazard according to CLP criteria.  
Precautionary statements Prevention Response No precautionary phrases  
Storage  
Disposal
- Safety data sheet available on request  
Sensitising components Contains triazole derivatives.  
May produce an allergic reaction
- 2.3. Other hazards This mixture does not contain any REACH registered substances that are assessed to be a PBT or a vPvB. Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis. Used oil may contain harmful impurities. High-pressure injection under the skin may cause serious damage including local necrosis. Not classified as flammable but will burn

### 3. Composition/information on ingredients

- 3.1. Mixtures  
 Chemical nature Blend of polyolefins and additives  
 Hazardous components

Chemical name	CAS-No. EC-No. Registration number	Classification (REGULATION (EC) No 1272/2008)	Concentration [%]
Distillates (Fischer - Tropisch), heavy, C18-50 – branched, cyclic and linear	848301-69-9 482-220-0 01-0000020163-82	Asp. Tox.1; H304	85- 95
Triazole derivative	91273-04-0 401-280-0	Skin Corr.1B; H314 Skin Sens.1A; H317 Aquatic Chronic1; H410	0,01 - 0,05

### 4. First aid measures

- 4.1. Description of first aid measures
- Protection of first-aiders When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.
- If inhaled No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.
- In case of skin contact Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available. If persistent irritation occurs, obtain medical attention. When using high pressure equipment, injection of product under the skin can occur. If high pressure injuries occur, the casualty should be sent immediately to a hospital. Do not wait for symptoms to develop. Obtain medical attention even in the absence of apparent wounds.
- In case of eye contact Flush eye with copious quantities of water. Remove contact lenses, if present and easy to do. Continue rinsing. If persistent irritation occurs, obtain medical attention.
- If swallowed In general no treatment is necessary unless large quantities are swallowed, however, get medical advice.
- 4.2. Most important symptoms and effects, both acute and delayed  
 Symptoms Oil acne/folliculitis signs and symptoms may include formation of black pustules and spots on the skin of exposed areas. Ingestion may result in nausea, vomiting and/or diarrhoea. Local necrosis is evidenced by delayed onset of pain and tissue damage a few hours following injection.
- 4.3. Indication of any immediate medical attention and special treatment needed
- 4.4. Treatment  
 Notes to doctor/physician:  
 Treat symptomatically.  
 High pressure injection injuries require prompt surgical intervention and possibly steroid therapy, to minimise tissue damage and loss of function. Because entry wounds are small and do not reflect the seriousness of the underlying damage, surgical exploration to determine the extent of involvement may be necessary. Local anaesthetics or hot soaks should be avoided because they can contribute to swelling, vasospasm and ischaemia. Prompt surgical decompression, debridement and evacuation of foreign material should be performed under general anaesthetics, and wide exploration is essential.

### 5. Firefighting measures

- 5.1. Extinguishing media  
 Suitable extinguishing media Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only. Do not use water in a jet  
 Unsuitable extinguishing media
- 5.2. Special hazards arising from the substance or mixture  
 Specific hazards during firefighting Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Unidentified organic and inorganic compounds
- 5.3. Advice for firefighters  
 Special protective equipment for firefighters Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).  
 Specific extinguishing methods Use extinguishing measures that are appropriate to local circumstances and the surrounding environment

### 6. Accidental release measures

- 6.1. Personal precautions, protective equipment and emergency procedures  
 Personal precautions 6.1.1 For non emergency personnel: Avoid contact with skin and eyes.  
 6.1.2 For emergency responders: Avoid contact with skin and eyes
- 6.2. Environmental precautions  
 Environmental precautions Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Local authorities should be advised if significant spillages cannot be contained
- 6.3. Methods and materials for containment and cleaning up  
 Methods for cleaning up Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material.  
 Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly
- 6.4. Reference to other sections



For guidance on selection of personal protective equipment see Chapter 8 of this Safety Data Sheet., For guidance on disposal of spilled material see Chapter 13 of this Safety Data Sheet

## 7. Handling and storage

- |   |   |
|---|---|
| General Precautions   | Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.      |
| 7.1. Precautions for safe handling                                |   |
| Advice on safe handling   | Avoid prolonged or repeated contact with skin.<br>Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. |
| 7.2. Conditions for safe storage, including any incompatibilities |   |
| Other data  | Keep container tightly closed and in a cool, well-ventilated place. Use properly labeled and closable containers. Store at ambient temperature. Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.                               |
| Packaging material  | Suitable material: For containers or container linings, use mild steel or high density polyethylene. Unsuitable material: PVC.  |
| Container Advice  | Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.  |
| 7.3. Specific end use(s)  |   |
| Specific use(s)   | Not applicable  |

## 8. Exposure controls/personal protection

- |   |   |
|---|---|
| 8.1. Control parameters                 |   |
| Occupational Exposure Limits            |   |
| Biological occupational exposure limits |   |
| No biological limit allocated.          |   |
| Monitoring Methods                      |   |
|   | Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory. Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.<br>National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods <a href="http://www.cdc.gov/niosh/">http://www.cdc.gov/niosh/</a><br>Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods <a href="http://www.osha.gov/">http://www.osha.gov/</a><br>Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances <a href="http://www.hse.gov.uk/">http://www.hse.gov.uk/</a><br>Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany <a href="http://www.dguv.de/inhalt/index.jsp">http://www.dguv.de/inhalt/index.jsp</a><br>L'Institut National de Recherche et de Sécurité, (INRS), France <a href="http://www.inrs.fr/accueil">http://www.inrs.fr/accueil</a>   |
| 8.2. Exposure controls                  |   |
| Engineering measures                    |   |
|   | The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.<br>General Information:<br>Define procedures for safe handling and maintenance of controls. Educate and train workers in the hazards and control measures relevant to normal activities associated with this product. Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation. Drain down system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or subsequent recycle. Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.  |
| 8.3. Personal protective equipment      |   |
|   | The provided information is made in consideration of the PPE directive (Council Directive 89/686/EEC) and the CEN European Committee for Standardisation (CEN) standards. Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.   |
| Eye protection                          | If material is handled such that it could be splashed into eyes, protective eyewear is recommended.<br>Approved to EU Standard EN166.   |
| Hand protection                         | Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC, neoprene or nitrile rubber gloves Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model. |
| Remarks                                 |   |
| Respiratory protection                  | No respiratory protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not maintain  |

airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours [Type A/Type P boiling point > 65°C (149°F)] meeting EN14387 and EN143.

- Thermal hazards Not applicable
- 8.4. Environmental exposure controls
  - General advice Take appropriate measures to fulfill the requirements of relevant environmental protection legislation. Avoid contamination of the environment by following advice given in Section 6. If necessary, prevent undissolved material from being discharged to wastewater. Wastewater should be treated in a municipal or industrial wastewater treatment plant before discharge to surface water. Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

**9. Physical and chemical properties**

9.1. Information on basic physical and chemical properties

Appearance	Liquid
Colour	Colourless
Odour	Slight hydrocarbon
Odour Threshold	Data not available
pH	Not applicable
pour point	: -48 °C Method: ISO 3016
Initial boiling point and boiling range	> 280 °C estimated value(s)
Flash point	260 °C, Method: ASTM D92 (COC)
Evaporation rate	Data not available
Flammability (solid, gas)	Data not available
Upper explosion limit	Typical 10 % (V)
Lower explosion limit	Typical 1 % (V)
Vapour pressure	< 0,5 Pa (20 °C) estimated value(s)
Relative vapour density	> 1 estimated value(s)
Relative density	0,832 (15,0 °C)
Density	: 832 kg/m <sup>3</sup> (15,0 °C) Method: ISO 12185
Solubility(ies)	
Water solubility	negligible
Solubility in other solvents	Data not available
Partition coefficient: n- octanol/water	log Pow: > 6 (based on information on similar products)
Auto-ignition temperature	> 320 °C
Decomposition temperature	Data not available
Viscosity	
Viscosity, dynamic	Data not available
Viscosity, kinematic	46 mm <sup>2</sup> /s (40,0 °C), Method: ISO 3104 8,7 mm <sup>2</sup> /s (100 °C), Method: ISO 3104
Explosive properties	Not classified
Oxidizing properties	Data not available

9.2. Other information

Conductivity This material is not expected to be a static accumulator

**10. Stability and reactivity**

- 10.1. Reactivity The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph
- 10.2. Chemical stability Stable. No hazardous reaction is expected when handled and stored according to provisions
- 10.3. Possibility of hazardous reactions
  - Hazardous reactions Reacts with strong oxidising agents.
- 10.4. Conditions to avoid
  - Conditions to avoid Extremes of temperature and direct sunlight
- 10.5. Incompatible materials
  - Materials to avoid Strong oxidising agents
- 10.6. Hazardous decomposition products
  - Hazardous decomposition products No decomposition if stored and applied as directed

**11. Toxicological information**

- 11.1. Information on toxicological effects
  - Basis for assessment Information given is based on data on the components and the toxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).
  - Information on likely routes of exposure Skin and eye contact are the primary routes of exposure although exposure may occur following accidental ingestion
  - Acute oral toxicity Product LD50 rat: > 5.000 mg/kg  
Remarks: Low toxicity: Based on available data, the classification criteria are not met.
  - Acute inhalation toxicity Remarks: Based on available data, the classification criteria are not met.
  - Acute dermal toxicity LD50 Rabbit: > 5.000 mg/kg

Skin corrosion/irritation Product	Remarks: Low toxicity: Based on available data, the classification criteria are not met.
Serious eye damage/eye irritation Product	Remarks: Slightly irritating to skin., Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis., Based on available data, the classification criteria are not met.
Respiratory or skin sensitisation Product	Remarks: Slightly irritating to the eye., Based on available data, the classification criteria are not met.
Components	Remarks: For respiratory and skin sensitisation; Not a sensitiser. Based on available data, the classification criteria are not met.
Germ cell mutagenicity Product	Triazole derivative: Remarks: May cause an allergic skin reaction in sensitive individuals.
Reproductive toxicity Product	Remarks: Non mutagenic, based on available data, the classification criteria are not met.
STOT - single exposure Product	Remarks: Not a developmental toxicant., Does not impair fertility. Based on available data, the classification criteria are not met.
STOT - repeated exposure Product	Remarks: Based on available data, the classification criteria are not met.
Aspiration toxicity Product	Remarks: Based on available data, the classification criteria are not met.
Further information Product	Not an aspiration hazard.
Summary on evaluation of the CMR properties	Remarks: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal., ALL used oil should be handled with caution and skin contact avoided as far as possible.
Germ cell mutagenicity-Assessment	Remarks: High pressure injection of product into the skin may lead to local necrosis if the product is not surgically removed.
Carcinogenicity-Assessment	Remarks: Slightly irritating to respiratory system.
Reproductive toxicity - Assessment	Remarks: Classifications by other authorities under varying regulatory frameworks may exist.

**12. Ecological information**

12.1. Toxicity	
Basis for assessment	Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).(LL/EL/IL50 expressed as the nominal amount of product required to prepare aqueous test extract).
Product:	
Toxicity to fish (Acute toxicity)	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to crustacean (Acute toxicity)	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to algae/aquatic plants (Acute toxicity)	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to fish (Chronic toxicity)	Remarks: Data not available
Toxicity to crustacean (Chronic toxicity)	Remarks: Data not available
Toxicity to microorganisms (Acute toxicity)	Remarks: Data not available
Components:	Triazole derivative
M-Factor (Short-term (acute) aquatic hazard)	1
12.2. Persistence and degradability	
Product:	
Biodegradability	Remarks: Not readily biodegradable., Major constituents are inherently biodegradable, but contains components that may persist in the environment.
12.3. Bioaccumulative potential	
Product:	
Bioaccumulation	Remarks: Contains components with the potential to bioaccumulate.
Partition coefficient: n-octanol/water	log Pow: > 6Remarks: (based on information on similar products)
12.4. Mobility in soil	
Product: Mobility	Remarks: Liquid under most environmental conditions. If it enters soil, it will adsorb to soil particles and will not be mobile. Remarks: Floats on water.
12.5. Results of PBT and vPvB assessment	

Product: assessment	This mixture does not contain any REACH registered substances that are assessed to be a PBT or a vPvB.
12.6. Other adverse effects Product: Additional ecological information	Does not have ozone depletion potential, photochemical ozone creation potential or global warming potential., Product is a mixture of non-volatile components, which will not be released to air in any significant quantities under normal conditions of use. Poorly soluble mixture. Causes physical fouling of aquatic organisms
<b>13. Disposal considerations</b>	
13.1. Waste treatment methods Product	Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Waste product should not be allowed to contaminate soil or ground water, or be disposed of into the environment. Waste, spills or used product is dangerous waste.
Contaminated packaging	Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand. Disposal should be in accordance with applicable regional, national, and local laws and regulations.
Local legislation Waste catalogue Waste Code Remarks	EU Waste Disposal Code (EWC): 13 01 11* Disposal should be in accordance with applicable regional, national, and local laws and regulations. Classification of waste is always the responsibility of the end user.
<b>14. Transport information</b>	
14.1. UN ADN ADR RID IMDG IATA	Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good
14.2. Proper shipping name ADN ADR RID IMDG IATA	Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good
14.3. Transport hazard class ADN ADR RID IMDG IATA	Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good
14.4. Packing group ADN CDNI Inland Water Waste Agreement ADR RID IMDG IATA	Not regulated as a dangerous good NST 3411 Mineral Lubricating Oils Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good
14.5. Environmental hazards ADN ADR RID IMDG	Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good Not regulated as a dangerous good
14.6. Special precautions for user Remarks	Special Precautions: Refer to Section 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.
14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable for product as supplied. MARPOL Annex 1 rules apply for bulk shipments by sea.
<b>15. Regulatory information</b>	
15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture REACH - List of substances subject to authorisation (Annex XIV) Volatile organic compounds	Product is not subject to Authorisation under REACH  0 %

Other regulations The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), annex XIV. Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), annex XVII. Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work and its amendments. Directive 1994/33/EC on the protection of young people at work and its amendments. Council Directive 92/85/EEC on the introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding and its amendments.

The components of this product are reported in the following inventories

EINECS All components listed or polymer exempt  
TSC All components listed

15.2. Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

**16. Other information**

16.1. Full text of H-Statements

H304 May be fatal if swallowed and enters airways  
H314 Causes severe skin burns and eye damage  
H317 May cause an allergic skin reaction  
H410 Very toxic to aquatic life with long lasting effects

16.2. Full text of other abbreviations

Aquatic Chronic Long-term (chronic) aquatic hazard  
Asp. Tox. Aspiration hazard  
Skin Corr. Skin corrosion  
Skin Sens. Skin sensitisation

16.3. Abbreviations and Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
AICS	Australian Inventory of Chemical Substances
ASTM	American Society for Testing and Materials
BEL	Biological exposure limits
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAS	Chemical Abstracts Service
CEFIC	European Chemical Industry Council
CLP	Classification Packaging and Labelling
COC	Cleveland Open-Cup
DIN	Deutsches Institut für Normung
DMEL	Derived Minimal Effect Level
DNEL	Derived No Effect Level
DSL	Canada Domestic Substance List
EC	European Commission
EC50	Effective Concentration fifty
ECETOC	European Center on Ecotoxicology and Toxicology Of Chemicals
ECHA	European Chemicals Agency
EINECS	The European Inventory of Existing Commercial Chemical Substances
EL50	Effective Loading fifty
ENCS	Japanese Existing and New Chemical Substances Inventory
EWC	European Waste Code
GHS	Globally Harmonised System of Classification and Labelling of Chemicals
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IC50	Inhibitory Concentration fifty
IL50	Inhibitory Level fifty
IMDG	International Maritime Dangerous Goods
INV	Chinese Chemicals Inventory
IP346	Institute of Petroleum test method N° 346 for the determination of polycyclic aromatics DMSO-extractables KECI = Korea Existing Chemicals Inventory LC50 = Lethal concentration fifty
LD50	Lethal Dose fifty per cent.
LL/EL/IL	Lethal Loading/Effective Loading/Inhibitory loading LL50 = Lethal Loading fifty
MARPOL	International Convention for the Prevention of Pollution From Ships
NOEC/NOEL	No Observed Effect Concentration / No Observed Effect Level
OE HPV	Occupational Exposure - High Production Volume PBT = Persistent, Bioaccumulative and Toxic
PICCS	Philippine Inventory of Chemicals and Chemical Substances
PNEC	Predicted No Effect Concentration
REACH	Registration Evaluation And Authorisation Of Chemicals
RID	Regulations Relating to International Carriage of Dangerous Goods by rail
SKIN_DES	Skin Designation
STEL	Short term exposure limit
TRA	Targeted Risk Assessment
TSCA	US Toxic Substances Control Act
TWA	Time-Weighted Average

vPvB	very Persistent and very Bioaccumulative
16.4. Further information	
Training advice	Provide adequate information, instruction and training for operators
Other information	No Exposure Scenario annex is attached to this safety data sheet as it is a non-classified mixture containing no hazardous substances.
	Under Article 31 of REACH, a SDS is not required for this product. Therefore, this SDS has been created on a voluntary basis to pass on potentially relevant information required under Article 32.
	A vertical bar ( ) in the left margin indicates an amendment from the previous version
Sources of key data used to compile the Safety Data Sheet	The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

## G. Torque settings

Inspect all bolt joints which may pose a hazard to people and machines at fixed intervals and check their torque.

Apply the torque values unless indicated otherwise on the drawing.

Nominal size	Strength class	Course pitch [Nm]	Fine pitch [Nm]
		(Copper-grease)	(Copper-grease)
		<b>0.08</b>	<b>0.08</b>
<b>M4</b>	<b>8.8</b>	2.2	
	<b>10.9</b>	3.2	
	<b>12.9</b>	3.8	
<b>M5</b>	<b>8.8</b>	4.3	
	<b>10.9</b>	6.3	
	<b>12.9</b>	7.4	
<b>M6</b>	<b>8.8</b>	7.4	
	<b>10.9</b>	10.9	
	<b>12.9</b>	12.5	
<b>M7</b>	<b>8.8</b>	12.0	
	<b>10.9</b>	17.5	
	<b>12.9</b>	20.5	
<b>M8</b>	<b>8.8</b>	18	19
	<b>10.9</b>	26	28
	<b>12.9</b>	31	32
<b>M10</b>	<b>8.8</b>	36	37
	<b>10.9</b>	52	55
	<b>12.9</b>	61	64
<b>M12</b>	<b>8.8</b>	61	63
	<b>10.9</b>	90	93
	<b>12.9</b>	105	109
<b>M14</b>	<b>8.8</b>	97	103
	<b>10.9</b>	145	150
	<b>12.9</b>	165	175
<b>M16</b>	<b>8.8</b>	145	155
	<b>10.9</b>	215	225
	<b>12.9</b>	250	270
<b>M18</b>	<b>8.8</b>	210	230
	<b>10.9</b>	300	330
	<b>12.9</b>	350	380
<b>M20</b>	<b>8.8</b>	300	320

Nominal size	Strength class	Course pitch [Nm]	Fine pitch [Nm]
		(Copper-grease)	(Copper-grease)
		<b>0.08</b>	<b>0.08</b>
	<b>10.9</b>	420	460
	<b>12.9</b>	500	530
<b>M22</b>	<b>8.8</b>	400	430
	<b>10.9</b>	570	610
	<b>12.9</b>	670	710
<b>M24</b>	<b>8.8</b>	510	640
	<b>10.9</b>	730	900
	<b>12.9</b>	850	1060
<b>M27</b>	<b>8.8</b>	750	920
	<b>10.9</b>	1070	1310
	<b>12.9</b>	1250	1530
<b>M30</b>	<b>8.8</b>	1000	1280
	<b>10.9</b>	1450	1820
	<b>12.9</b>	1700	2130
<b>M33</b>	<b>8.8</b>	1400	1700
	<b>10.9</b>	1950	2430
	<b>12.9</b>	2300	2840
<b>M36</b>	<b>8.8</b>	1750	2230
	<b>10.9</b>	2500	3170
	<b>12.9</b>	3000	3710
<b>M39</b>	<b>8.8</b>	2300	2850
	<b>10.9</b>	3300	4050
	<b>12.9</b>	3800	4740



## Z. Compatibility of system parts

### 1. Specification of system parts

#### a. Lifting units

For Ga-drawing and Load chart is made to ref 5 "Technical handbook".

Lifting unit	Article number	GA Drawing	Load chart	Pitch of wheels [mm]	Max height [mm]	Max capacity [kN]
SL100	03730.01.00.00	03730.50.00.00	ED.03730.70.001	610	4750	250
SL200	03731.01.00.00	03646.50.00.00	ED.03731.70.001	610	6700	500
SL300	03865.01.00.00	03865.50.00.00	ED.03865.70.001	610	6710	750
SL400N	03864.01.00.00	03864.50.00.00	ED.03864.70.001	610	7700	1000
SL400	03442.01.00.00	03864.50.00.00	ED.03864.70.001	914	9140	1000

#### b. Side shift units

Standard systems Side Shift Unit	Article number	GA Drawing	Capacity per anchor [kN]
SSU150	03842.01.00.00	03842.50.00.00	375
SSU300	03636.01.00.00	03636.50.00.00	750
SSU600	03530.01.00.00	03530.50.00.00	1500

Obsolete systems

Side Shift Unit	Article number	GA Drawing	Capacity per anchor [kN]
BSSL125	03697.01.00.00	03697.50.00.00	312.5

Top Swivel Kit	Article number	GA Drawing	Capacity per anchor [kN]
TSK150	03842.01.04.00	03842.01.04.00	375
TSK300	03636.01.10.00	03636.50.10.00	750
TSK600	03530.01.11.00	03530.50.11.00	1500

Side Shift Sling Guide	Article number	GA Drawing	Capacity per anchor [kN]
SSG150	03842.01.03.00	03842.50.03.00	375
SSG300	03636.01.11.00	03636.50.1100	750
SSG600	03530.01.05.00	03530.50.05.00	1500

Rotation Anchor Kit	Article number	GA Drawing	Capacity per anchor [kN]
RAK300	03636.01.12.00	03636.50.12.00	750

### c. Header beams

#### Standard beams

Headerbeam	Article number	GA Drawing	Load chart	Length [m]	Height [mm]	Width [mm]
HBH-6	03878.01.00.00	03878.50.00.00	ED. 03878.70.001	6	432	307
HBH-8	03817.01.00.00	03817.50.00.00	ED. 03817.70.001	8	527	306
HBB-8	02843.01.00.00	02843.50.00.00	ED. 02843.70.001	8	600	480
HBB-10	02940.01.00.00	02940.50.00.00	ED.02940.70.001	10	600	480
HBB-12	03302.01.00.00	03302.50.01.00	ED.03302.70.001	12	950	480

#### Special beams (not in catalogue; maybe extended delivery time)

Headerbeam	Article number	GA Drawing	Load chart	Length [m]	Height [mm]	Width [mm]
Connectable	03672.01.00.00	03672.50.00.00	ED.03672.70.118	18	1025	480

#### Obsolete beams

Headerbeam	Article number	GA Drawing	Load chart	Length [m]	Height [mm]	Width [mm]
HBSL 125-6	03645.01.00.00	03645.50.00.00	ED.03645.70.001	6	432	307
HBSL 125-8	03646.01.00.00	03646.50.00.00	ED.03646.70.001	8	524	306
HBSL 200-8	03817.01.00.00	03817.50.00.00	ED.03817.70.001	8	572	306
HBSL 125-10	03647.01.00.00	03647.50.00.00	ED.03647.70.001	10	668	305
HBSL 125-12	03648.01.00.00	03648.50.00.00	ED.03648.70.001	12	716	305
HBSBL-6	02939.01.00.00	02939.50.00.00	ED.02939.70.001	6	600	480
HBSBL-8	02843.01.00.00	02843.50.00.00	ED.02843.70.001	8	600	480
HBSBL-10	02940.01.00.00	02940.50.00.00	ED.02940.70.001	10	600	480
HBSBL-12	03302.01.00.00	03302.50.01.00	ED.03302.70.001	12	950	480

### d. Lifting lugs

#### Standard Lugs

Lifting Lug	Article number	GA Drawing	Hole [mm]		Capacity per anchor [kN]
			height	Width	
LL200	03889.01.00.00-01	03889.50.00.00-01	582	320	500
LL500	03890.01.01.00-01	03890.50.01.00-01	1100	490	1250
LL1000	03890.01.01.00	03890.50.01.00	1100	490	2500

#### Obsolete lugs

Lifting Lug	Article number	GA Drawing	Hole [mm]		Capacity per anchor [kN]
			height	Width	
LLSL200-8	03817.01.00.00-03	03817.50.00.00-03	582	320	500
LLSL125-10	03647.01.00.00-03	03647.50.00.00-03	678	320	312.5
LLSL125-12	03648.01.00.00-03	03648.50.00.00-03	730	320	312.5
LLSBL125	02940.01.02.00-01	02940.50.02.00-01	1100	490	1250
LLSBL250	02940.01.02.00	02940.50.02.00	1100	490	2500

### e. Skid tracks

#### Standard tracks

Skid tracks	Article number	GA Drawing	Pitch [mm]	Length [mm]
GST100-6	03866.01.01.00	03866.50.01.00	612	6000
GST100-3	03866.01.02.00	03866.50.02.00	612	3000
GST400-6	03869.01.01.00	03869.50.01.00	610	3000
GST400-3	03869.01.02.00	03869.50.02.00	610	5900
GST1100-6	03870.01.01.00	03870.50.01.00	914	5900
GST1100-3	03870.01.02.00	03870.50.02.00	914	3000

#### Obsolete tracks

Skid tracks	Article number	GA Drawing	Pitch [mm]	Length [mm]
STSL125-6	02913.01.01.01	02913.50.01.01	612	6000
STSL125-3	02913.01.01.02	02913.50.01.02	612	3000
STSL200-6	03818.01.01.00	03818.50.01.00	610	5900
STSL200-3	03818.01.02.00	03818.50.02.00	610	3000
STSL300-6	03690.01.01.00	03690.50.01.00	610	5900
STSL300-3	03690.01.02.00	03690.50.02.00	610	3000
STSBL-6	03134.01.01.00	03869.50.01.00	914	5900
STSBL-3	03134.01.03.00	03869.50.03.00	914	5900

### f. Sling guides

Sling guide	Article number	GA Drawing	Header beam width [mm]	Capacity per sling guide [kN]
HBHSG	03893.01.00.00	03893.50.00.00	300 – 310 mm	500
HBBSG	03892.01.00.00	03892.50.00.00	480 mm	2500

## 2. Compatibility of the system parts

Compatible	Not Compatible
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### a. Gantries and header beams

All gantries and header beams are compatible to each other.

### b. Gantries and skid tracks

Skid track		Gantry				
		SL100	SL200	SL300	SL400N	SL400
		03730.01.00.00	03731.01.00.00	03865.01.00.00	03864.01.00.00	03442.01.00.00
GST100-6	03866.01.01.00	C	NC	NC	NC	NC
GST100-3	03866.01.02.00	C	NC	NC	NC	NC
GST400-6	03869.01.01.00	C	C	C	C	NC
GST400-3	03869.01.02.00	C	C	C	C	NC
GST1100-6	03870.01.01.00	NC	NC	NC	NC	C
GST1100-3	03870.01.02.00	NC	NC	NC	NC	C
STSL125-6	02913.01.01.01	C	NC	NC	NC	NC
STSL125-3	02913.01.01.02	C	NC	NC	NC	NC
STSL200-6	03818.01.01.00	C	C	C	NC	NC
STSL200-3	03818.01.02.00	C	C	C	NC	NC
STSL300-6	03690.01.01.00	C	C	C	NC	NC
STSL300-3	03690.01.02.00	C	C	C	NC	NC
STSBL-6	03134.01.01.00	NC	NC	NC	NC	C
STSBL-3	03134.01.03.00	NC	NC	NC	NC	C

**c. Header beams and lifting lugs**

Lifting lugs		Header beams														
		HBH-6	HBH-8	HBB-8	HBB-10	HBB-12	HBSL 125-6	HBSL 125-8	HBSL 200-8	HBSL 125-10	HBSL 125-12	HBSBL-6	HBSBL-8	HBSBL-10	HBSBL-12	Connectable
		03878.01.00.00	03817.01.00.00	02843.01.00.00	02940.01.00.00	03302.01.00.00	03645.01.00.00	03646.01.00.00	03817.01.00.00	03647.01.00.00	03648.01.00.00	02939.01.00.00	02843.01.00.00	02940.01.00.00	03302.01.00.00	03672.01.00.00
LL200	03889.01.00.00-01	C	C	NC	NC	NC	C	C	C	NC	NC	NC	NC	NC	NC	NC
LL500	03890.01.01.00-01	NC	NC	C	C	C	NC	NC	NC	NC	NC	C	C	C	C	C
LL1000	03890.01.01.00	NC	NC	C	C	C	NC	NC	NC	NC	NC	C	C	C	C	C
LLSL200-8	03817.01.00.00-03	C	C	NC	NC	NC	C	C	C	NC	NC	NC	NC	NC	NC	NC
LLSL125-10	03647.01.00.00-03	C	C	NC	NC	NC	C	C	C	C	NC	NC	NC	NC	NC	NC
LLSL125-12	03648.01.00.00-03	C	C	NC	NC	NC	C	C	C	C	C	NC	NC	NC	NC	NC
LLSBL125	02940.01.02.00-01	NC	NC	C	C	C	NC	NC	NC	NC	NC	C	C	C	C	C
LLSBL250	02940.01.02.00	NC	NC	C	C	C	NC	NC	NC	NC	NC	C	C	C	C	C

**d. Lifting lugs with header beam type wide / narrow**

Lifting lugs		Header beam type	
		Narrow	Wide
LL200	03889.01.00.00-01	C	NC
LL500	03890.01.01.00-01	NC	C
LL1000	03890.01.01.00	NC	C
LLSL200-8	03817.01.00.00-03	C	NC
LLSL125-10	03647.01.00.00-03	C	NC
LLSL125-12	03648.01.00.00-03	C	NC
LLSBL125	02940.01.02.00-01	NC	C
LLSBL250	02940.01.02.00	NC	C

**e. Headerbeams with side shift units**

Side Shift Unit		Header beam														
		HBH-6	HBH-8	HBB-8	HBB-10	HBB-12	HBSL 125-6	HBSL 125-8	HBSL 200-8	HBSL 125-10	HBSL 125-12	HBSBL-6	HBSBL-8	HBSBL-10	HBSBL-12	Connectable
		03878.01.00.00	03817.01.00.00	02843.01.00.00	02940.01.00.00	03302.01.00.00	03645.01.00.00	03646.01.00.00	03817.01.00.00	03647.01.00.00	03648.01.00.00	02939.01.00.00	02843.01.00.00	02940.01.00.00	03302.01.00.00	03672.01.00.00
SSU150	03842.01.00.00	C	C	NC	NC	NC	C	C	C	C	C	NC	NC	NC	NC	NC
SSU300	03636.01.00.00	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
SSU600	03530.01.00.00	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
BSSL125	03697.01.00.00	C	C	NC	NC	NC	C	C	C	C	C	NC	NC	NC	NC	NC
BSSBL600	02907.01.00.00	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

**f. Top swivel kit and side shift unit**

Top swivel kit		Side shift unit				
		SSU150	SSU300	SSU600	BSS1125	BSSBL600
		03842.01.00.00	03636.01.00.00	03530.01.00.00	03697.01.00.00	02907.01.00.00
TSK150	03842.01.04.00	C	NC	NC	NC	NC
TSK300	03636.01.10.00	NC	C	NC	NC	NC
TSK600	03530.01.11.00	NC	NC	C	NC	NC

**g. Side shift Sling Guide with side shift unit**

Side shift Sling Guide		Side shift unit		
		SSU150	SSU300	SSU600
		03842.01.00.00	03636.01.00.00	03530.01.00.00
SSG150	03842.01.03.00	C	NC	NC
SSG300	03636.01.11.00	NC	C	NC
SSG600	03530.01.05.00	NC	NC	C

**h. Rotation anchor kit and side shift unit**

Rotation Anchor Kit		Side shift unit				
		SSU150	SSU300	SSU600	BSSL125	BSSL600
		03842.01.00.00	03636.01.00.00	03530.01.00.00	03697.01.00.00	02907.01.00.00
<b>RAK300</b>	<b>03636.01.12.00</b>	NC	C	NC	NC	NC

**i. Header beams and sling guides**

Sling guide		Header beam													
		HBH-6	HBH-8	HBB-8	HBB-10	HBB-12	HBSL 125-6	HBSL 125-8	HBSL 125-10	HBSL 125-12	HBSBL-6	HBSBL-8	HBSBL-10	HBSBL-12	Connectable
		03878.01.00.00	03817.01.00.00	02843.01.00.00	02940.01.00.00	03302.01.00.00	03645.01.00.00	03646.01.00.00	03647.01.00.00	03648.01.00.00	02939.01.00.00	02843.01.00.00	02940.01.00.00	03302.01.00.00	03672.01.00.00
<b>HBHSG</b>	<b>03893.01.00.00</b>	C	C	NC	NC	NC	C	C	C	C	NC	NC	NC	NC	NC
<b>HBBSG</b>	<b>03892.01.00.00</b>	NC	NC	C	C	C	NC	NC	NC	NC	C	C	C	C	C